Autism and developmental language disorder implications from a follow-up in early adult life.

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AUTISM AND DEVELOPMENTAL LANGUAGE DISORDER: IMPLICATIONS FROM A FOLLOW-UP IN EARLY ADULT LIFE

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ABSTRACT

A follow-up comparison into early adulthood of young men with a history of either autism or developmental mixed receptive-expressive language disorder is reported. The groups were first studied in early childhood when all subjects had non-verbal IQ's above 70; a second comparison with more limited data took place in middle childhood. In the current study there were 19 subjects with autism and 20 with language disorder, ranging in age from 21 to 28 years. Methods included informant and subject interviews, psychometric testing and video observation. These were used to evaluate speech and language; cognitive functioning; social behaviours; education and attainments; independence; employment experience; behavioural functioning; non-autistic psychiatric symptomatology and socio-emotional functioning. A few of the autism group had made very good progress and were living and working independently. The majority, however, showed continuing difficulties in most areas and, even amongst those who had made the best progress, residual problems were apparent, evidenced in particular by a lack of sexual relationships. A comparison showed that the language-disordered subjects had better outcomes in almost every area of functioning. Nonetheless there was still much evidence amongst them of impairment, particularly in the domains of social and behavioural functioning and educational attainments. Discriminant function analysis indicated greater areas of overlap between the adult groups than there had been in early childhood. The data did not support the view that all of the continuing difficulties found in the language-disordered group were merely a secondary consequence of their early language deficit, and the question of whether there may be genetic links between the two disorders was considered. An additional finding was that two members of the language-disordered group had developed a paranoid psychosis in late adolescence. The implications for concepts of developmental language disorder are discussed.

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SECTION A

BACKGROUND TO THE STUDY

This is a report of a follow-up into adult life of individuals with normal intelligence and either autism or specific developmental language disorder. The purpose of the study was to investigate the nature of both disorders in adulthood and to compare their outcomes. In order to appreciate the issues involved, and why this comparison should be of value, it is necessary to examine previous work covering both disorders. A good starting point for this review is the work that has addressed the nature of the underlying deficit in autism.

CHAPTER ONE; - UNDERLYING DEFICITS

GENERAL ORIENTATION

From the very first description of autism, when Kanner presented his systematic observations on 11 children with a previously unrecognised syndrome (Kanner, 1943), it was clear that language abnormalities play an important role in the syndrome. In this original paper, and in a later exposition, Kanner (1946) drew attention to delays in the acquisition of speech and the non-communicative use of speech after it does develop, together with abnormalities of language, especially the reversal of personal pronouns and echoing. These characteristics were described as existing alongside other aspects of the syndrome, such as an inability to develop relationships with people, a good rote memory, normal physical appearance and an apparently obsessive desire for the maintenance of sameness.

For a number of years after the syndrome was described there was considerable controversy over where its boundaries lay. Many different behavioural disturbances had been noted in children with autism but it was unclear which ones were specifically characteristic of autism and research into the syndrome was limited by this confusion. An important step forward was made when the diagnostic criteria were clarified in a study that compared the symptoms of children with autism with those of children of the same age, sex and general intelligence, but with other learning disorders (Rutter, 1966; Rutter and Lockyer, 1967). The three symptoms that were specific and universal to autism were a profound and general failure to develop social relationships; language retardation with impaired comprehension, echolalia and pronoun reversal, and ritualistic or compulsive phenomena. Other symptoms in the form of stereotyped repetitive movements, a short attention span, self-injury and delayed bowel control were found significantly more frequently in the autism group, but were not universal.

Once the diagnostic criteria were established it was possible for more meaningful research to be carried out, and there was a surge of interest in autism. The particular focus of interest was in identifying the underlying basis of the disorder. There were a number of suggestions that autism might have psychogenic origins, with abnormal or damaged family relationships playing a significant role (Bettelheim, 1967; Eisenberg and Kanner, 1956; Kanner, 1949), but overall there was little supportive evidence in their favour (Rutter, 1974) and, with time, attention turned towards the role of intellectual impairments in autism.

A COGNITIVE DEFICIT INVOLVING LANGUAGE?

Evidence that the underlying deficit in autism may be a cognitive one came from follow-up studies that described the course of the disorder through childhood and adolescence, into adulthood. In these, IQ level was found to be the most important prognostic factor (Lotter, 1974; Rutter, 1968) with Rutter, Greenfeld and Lockyer (1967) finding that children who were untestable on any IQ test, or had an IQ below 60, had a particularly poor outcome. Although the majority of children with autism score in the learning-disabled range (i.e. IQ < 70) on conventional IQ tests, approximately a fifth to a quarter score in the normal range (DeMyer et al., 1974; Freeman et al., 1985; Rutter and Lockyer, 1967) and it is amongst this group that outcome tends to be more favourable.

However, in addition to IQ, the presence of language is also a crucial predictive factor. Kanner, Rodriguez and Ashenden (1972) found that adult prognosis varied significantly according to whether the child had useful speech at 5 years, and Lotter (1978), in a review of 25 follow-up studies reported that although the groups were very heterogeneous, the majority of investigations found the presence of useful speech at 5 years to be related to outcome. More recent studies have reached similar conclusions (e.g. Chung, Luk and Lee, 1990;

Venter, Lord and Schopler, 1992). It cannot necessarily be inferred from the findings on outcome that there is a direct causal relationship between deficits in IQ and language, and autism. Nonetheless, when taken in combination with the other evidence that follows, the data on prognostic factors do add strength to the argument that the underlying deficit in autism is a cognitive one, and that language has a particular role to play in this (Rutter, 1983).

Further evidence to support this theory comes from examining the pattern of results in cognitive testing. Children with autism tend to show a rather specific patterning of abilities, with their performance peaks occurring in the purely visuo-motor tasks and their poorest performances being on those tests that require verbal concepts, abstraction or symbolisation (DeMyer et al., 1974; Lockyer and Rutter, 1970). It appears that in autism there is difficulty in making use of language to establish the meaning of a situation and this was confirmed by a series of experiments designed to investigate cognitive performance (Hermelin and O'Connor, 1970). Sequences of words were arranged randomly to make either nonsense sentences or meaningful sentences, and were then presented to normal children and children with autism. The normal children were significantly better at recalling the meaningful sentences than the random arrangements, indicating that they were making use of word meaning to aid recall. The children with autism, on the other hand, appeared to find meaning less important and although they, too, were better at recalling the meaningful sentences, the effect was much less marked than in the normal children. Hermelin and O'Connor concluded that the processes for verbal coding appeared to be deficient in children with autism, together with a relative absence of semantic and syntactic analysis.

Additional data on the pattern of abilities on verbal tests came from a study in which Tubbs (1966) administered the Illinois Test of Psycholinguistic Abilities to children with autism. She found that they showed a specific pattern of language deficits and were particularly poor at

understanding the meaning of spoken words; in their use of gesture, and in tasks that required cross-modal coding[1].

Taken overall, there is strong evidence to support the hypothesis that a cognitive-linguistic deficit underlies the fundamental problems associated with autism (Rutter, 1983). Indeed, in accordance with this view the American Psychiatric Association (1980) reclassified autism as a pervasive developmental disorder instead of a mental illness. The crucial issue that needs to be considered, however, is whether this deficit is itself the fundamental basis of the disorder or whether it is a secondary consequence of another primary deficit, the most likely contender for which would be social withdrawal.

COULD THE COGNITIVE DEFICIT BE SECONDARY TO SOCIAL WITHDRAWAL?

If this argument is pursued and social withdrawal is taken to be the underlying cause of the intellectual impairments in autism, it could reasonably be assumed that abnormal social behaviour would result in misleading scores in IQ testing. If test performance were under the control of motivational factors, a child with autism might know the right answers, but deliberately fail to provide them - the phenomenon of 'negativism'. In an elegant experiment designed to examine the role of motivational factors in IQ testing, Clark and Rutter (1979) manipulated the difficulty of tasks presented, from easy to difficult and back to easy, several times. They found that the children with autism who had started to get answers wrong as the task got more difficult began to get correct answers again as the task got easier. This

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[1]E.g. for vocal encoding the stimulus is visual and the response verbal, and in motor encoding the stimulus is visual and a gesture is required as a response.

demonstrated neatly that the low IQ scores shown by many children with autism cannot be attributed to motivational factors, but are indeed related to the difficulty of the task.

A number of other studies have confirmed that IQ scores in children with autism have the same properties as those in other children and it is therefore unlikely that their impaired intellectual functioning can be explained as a secondary consequence of poor social functioning. In particular the stability of IQ in children with autism has been found to be similar to that found in other groups, so that the IQ at one age correlates quite highly with an IQ score at a later age (Goode, Howlin and Rutter, 1994; Lockyer and Rutter, 1969), and even when intensive treatments significantly improve social and behavioural functioning, IQ remains relatively unaffected (Hemsley et al., 1978; Rutter and Bartak, 1973). Also, it appears that the IQ scores obtained by children with autism have broadly the same predictive properties as those obtained by other children, so that IQ is a reasonably good predictor of later educational achievements. This finding has been confirmed by a number of studies that have shown positive correlations between IQ and reading (Bartak and Rutter, 1971; Lotter, 1978; Mittler, Gillies and Jukes, 1966) and suggests that IQ scores have much the same long-term validity in children with autism as in other children.

A related question is whether the language problems in autism could be secondary to social withdrawal. This hypothesis can, however, be rejected on a number of different grounds. Firstly, the very fact that the language in autism is so deviant, sets it apart from a disorder such as elective mutism, which can at least partly be attributed to motivational factors. It is difficult to explain features such as "pronominal reversal", "metaphorical language" and "delayed echolalia" in terms of social withdrawal. Secondly, the disturbances in language development appear to be present from a very young age, and again this is an observation that tends to weaken any argument in which a social causation is implicated. About half the children with autism studied by Bartak, Rutter and Cox (1975) were reported to have deficient

or deviant babble. Looking more closely at the interaction between language and social responsiveness, it has been found that children with autism can improve in social involvement but still remain without speech (Rutter, 1965; Rutter et al., 1967). Likewise in others, language improves but social skills remain limited (Bemporad, 1979; Kanner, 1971; Kanner et al., 1972; Rutter, 1970). In general, language and social responsiveness tend to run in parallel, but these examples of divergent development suggest that the language deficit cannot be due to social withdrawal. Similarly it is difficult to explain the specific patterning of scores on non-verbal and verbal IQ tests, or the apparent failure to use verbal meaning in memory and thought processes, as secondary consequences of social withdrawal (Rutter, 1983).

IS THE DEFICIT IN AUTISM RESTRICTED TO LANGUAGE FUNCTIONS?

Much of the available evidence points towards language impairment being a key feature in autism, and the next question that needs to be posed is how far the cognitive deficit can be accounted for by linguistic impairments. Before discussing how this issue might be addressed, however, the fundamental relationships between cognition and language need to be considered in more detail. An essential question is how language relates to other cognitive systems. Is it connected to them or embedded within them, or is it an autonomous aspect of the mind? This is a field that is riddled with controversy, and a basic area of argument has centred around the debate between those theorists who view cognitive processes as essentially 'interactionist' in nature and those who see them as being 'modular'. A summary of this debate is presented below. This is followed by a consideration of what happens when there is a disruption in the normal process of language development. At this point research findings from the field of developmental language disorders are introduced; the associated problems, and theories of causality are discussed, and then having

considered these issues the original question is returned to:- 'is autism simply an extreme form of language disorder?'.

THE RELATIONSHIP BETWEEN COGNITION AND LANGUAGE

The 'modular' versus the 'interactionist' debate

Bates, Bretherton and Snyder (1988) presented a thorough analysis of this debate and a summary is given here. Taking the domain of language as an example, proponents of the interactionist view (e.g. Sternberg, 1985) have argued that this is an interactive system depending on processes and representations from a variety of cognitive domains. Hence a common stock of mechanisms for perception, storage, recognition and retrieval of information are applied to a variety of linguistic areas such as phonology and grammar, and language and cognition develop interactively. Schlesinger (1977, p 166) suggested that 'on first dealing with an aspect of his surroundings the child may understand it only vaguely and imperfectly; the manner of talking about it then points the way for the child to gain a finer grasp of the distinction in question'. Gopnik (1984), for example, explored the relationships between developmental use of the word 'gone' and the concepts it encodes in children who were 12, 15 or 18 months at the start of the study. She found that the children started to use the word 'gone' at about the same time they were developing the concept of 'gone'. Gopnik speculated that use of the word may have helped the child in developing the object concept. For example, 'gone' when applied to objects disappearing in all sorts of ways might lead the child to consider the similarities of these events.

The modular approach, on the other hand, takes the stance that cognitive modules are self-contained components of mind with each module containing the processes or representations needed to operate in a specific content domain. Gardner (1983) has been a major proponent of this approach, suggesting that there are at least seven independent modules (linguistic,

musical, logical-mathematical, spatial, bodily-kinaesthetic, interpersonal and intrapersonal), each containing its own memory and perceptual responses, together with a unique neural mechanism or computation capacity genetically programmed to be triggered by particular kinds of information. The importance of this argument for language development lies in the implication that although modules can interact with each other in the tasks of language processing they can also develop independently (e.g. out of synchrony with other aspects of intelligence), and can break down independently in various forms of brain damage. Cromer (1991, pp132-6), for example, described a case (DH) of a spina-bifida child with arrested hydrocephalus that suggested language acquisition may take place relatively independently of intelligence. DH showed speech that 'is fluent, appropriate and not bizarre, is filled with complex syntactic forms, shows the correct use of semantic constraints, an extensive vocabulary and incorporates the use of normal pragmatic devices. She gives every evidence of understanding the conversation'. In contrast she performed on a variety of standardised tests of intellectual ability at the severely retarded level, and also functioned in everyday life at the retarded level so that by her late teenage years she was still unable to read and write and had not learnt to handle money. Bishop (1992) agreed that case studies of this kind are of great potential interest for those working on developmental language disorders as they provide a way of assessing how far a given cognitive deficit can be a plausible explanation for poor language development. She did point out, however, that in this type of study the evidence for good language skills is based mainly on analysis of spontaneous speech whilst on formal language tests performance is severely impaired. She cautioned therefore that the evidence from such cases should be treated with care.

There is necessarily some overlap between the interactive and the modular approaches. This stems from the assumption that the mind does have an internal structure. Unless the mind is viewed as being completely structureless then it is reasonable to assume that there is some form of module, however small. These might, for example be nodes or stored responses that can be connected to one another by an associative process. The form of the modules in human mental activity is therefore an important source of debate, as is the nature

of the relationship between modules and content domains such as language and spatial knowledge.

Debate also exists amongst the modularists themselves and in essence this revolves around the notions of 'horizontal' and 'vertical' faculties, a distinction suggested by Fodor (1983). Vertical faculties can be viewed as mechanisms that have developed to meet the demands of one particular bounded domain of knowledge, e.g. face recognition. Horizontal faculties on the other hand are 'functionally distinguishable cognitive system(s) whose operations cross content domains'. Fodor argued that cognitive science is doomed unless the mind can be characterised mainly by vertical modules, since they have discernible boundaries and so are available for study. He described horizontal faculties, on the other hand, as being so vague and unbounded that empirical investigation of them is impossible. Bates et al. (1988), however, argued that this is not necessarily true, since a correlational method of study can be employed in exploring the nature of horizontal processes. In the context of language development they suggested exploring which other cognitive functions develop with the emergence of various language abilities, as well as highlighting the need to examine those cognitive functions that are lacking when language is delayed. Using such a strategy within a longitudinal framework they studied the language development of children at 10, 13, 20 and 28 months. They concluded that several different 'modules' or mechanisms contribute to the passage from preverbal communication to the productive use of naming. They described these as being the social factors that underlie preverbal gestural communication, the analytic mechanisms responsible for early tool use and the imitative mechanisms that permit the child to pick up arbitrary symbol-referent bonds in language and in symbolic play. Although all these factors seemed to play a role in the emergence of symbols there were individual differences and the different modules seemed to be partially dissociable. The fact that these factors cut across cognitive domains was taken as evidence of horizontal modules, a viewpoint that is in many ways similar to that of the interactionist proponents.

Leading on from this view that different cognitive demands are implicated in language development, Tager-Flusberg (1994) described how the process of language acquisition appears to be multiply determined by the complex interaction of biological, cognitive and social aspects of maturation. According to this view, children construct language for themselves, making use of innate language-specific capacities and other conceptual developments that interact with specific experiences in the physical and social environment. During normal development these multiple determinants lead to an integrated linguistic system that can be used easily in all contexts. When one or more of these crucial factors is disrupted in some way there is a profound impact on the course of language development, and it is by looking at cases in which the usual picture of development is disturbed that we can learn most about language acquisition (Cromer, 1991).

Links between language impairments and learning/cognitive deficits

To examine the effects of a disruption in language development it is necessary to focus on research involving children with developmental language disorders. However, language may fail to develop for many different reasons and the heterogeneity of subjects in different investigations has seriously limited the extent to which we can generalise findings from one study to another. Some have used children with normal comprehension of speech but impaired production; others have used subjects with both comprehension and production difficulties, yet others have studied a very mixed group of language impairments.

Another factor that has led to confusion in interpreting the literature has been the variety of terms used to refer to severe delays in language development (e.g. specific developmental language disorder, dysphasia). Precise details of the diagnostic criteria used are not always available in published reports, but for the sake of consistency the term 'developmental language disorder' will be used here to refer to the severe delays of language development,

regardless of the actual term used by the author in the report. However, when it is clear from the description that a group is special in some way this will be specified.

The cognitive deficits are likely to be different in the various language disabilities but in the following review, at least where research designs allow, the emphasis will be placed on the *more serious* developmental disorders of receptive language, since it is these that most closely resemble the language problems found in autism. In DSM-IV (American Psychiatric Association, 1994) they are referred to as 'mixed receptive-expressive language disorders' since they always involve expression; the term 'expressive language disorder' is reserved for those cases where the impairment is largely or entirely restricted to expressive language. Children with these particular problems were first systematically described by Ingram (1959), although not using this terminology . In studying the wider population of children presenting with speech delay he identified a small sub-group of children who although of normal intelligence, had been delayed in speech development from infancy. There was no known aetiology for their language delay since they did not demonstrate any global learning disability, neurological disorder, local abnormality of the speech apparatus, acquired lesions or unusual psycho-social environment; nevertheless they showed a severe disorder affecting both receptive and expressive language.

There are a number of basic differences between these mixed receptive-expressive language disorders and specific expressive delays. In the expressive disorders there is a definite sex bias, with various studies reporting between two and three times as many boys as girls suffering from the problem (Morley, 1965; Robinson, 1987; Silva, 1980). On the other hand the disorders involving receptive language appear to have an approximately equal sex ratio (Bartak et al., 1975). In addition it will be seen later, in this chapter and Chapter Two, that there are more socio-emotional problems and deviant language features associated with the disorders of receptive language, and also the prognosis in the expressive disorders is generally better. Taken together there is an abundance of evidence that the

mixed receptive-expressive disorders and specific expressive delays do indeed need to be considered as separate groups.

Various problems seem to be associated with language disorders. It is well-established that language is important to general intellectual development (Rutter, Graham and Yule, 1970) and therefore those intellectual processes that require symbolisation and abstraction are likely to be seriously impaired where there is a paucity of language. In particular, language is important for forming concepts and solving problems (de Ajuriaguerra, 1966; Luria, 1957; Luria and Yudovich, 1959; Vygotsky, 1962) and any child who has impairments in language is likely to experience difficulties in logical thought. Another skill that is closely intertwined with language development is reading and many studies have found that this, too, is vulnerable to delay where there is a language impairment (e.g. Aram, Ekelman and Nation, 1984; Silva, McGee and Williams, 1983; Stark et al., 1984). Work by Goswami and Bryant (1990) highlighted the importance of phonological awareness in learning to read and this may be one route through which a language impairment might affect reading ability. Similarly, it is not difficult to envisage how deficits in the use and understanding of symbols at a fundamental level could affect reading ability, and there have been suggestions that the difficulties may be due, in part, to difficulties with visual sequencing (Rutter and Yule, 1973), although Vellutino (1979) in looking at a group of backward readers found that visual memory did not seem to be any poorer in the reading-delayed children than in better readers of the same age.

The issue of whether language-impaired children have difficulties with visual sequencing remains somewhat uncertain, but it is well-established that they often have difficulties with verbal sequencing tasks (Furth, 1964; Lowe and Campbell, 1965; Poppen et al., 1969). Other aspects of cognitive functioning that have been reported as being subtly impaired in children with language disorders are representational or symbolic thinking (Morehead and Ingram, 1973), auditory memory (Masland and Case, 1968; Menyuk, 1964) and speed of

auditory processing (Tallal, 1976; Tallal and Piercy, 1974). In this latter study it was found that children with developmental language disorders were specifically impaired in their ability to process rapidly changing acoustic stimuli. Tallal and Piercy argued that developmental language disorder results from an impaired rate of auditory processing and is not specifically a verbal deficit. Individual differences in the speed of auditory processing appear to correlate with individual differences in the language abilities of children. The greater the speed constraint, the fewer speech sounds will be accurately processed and hence the greater the language disorder. Nonetheless it is not clear how this deficit in basic auditory processing can explain the full range of language problems with which language-disordered children present (Tager-Flusberg, 1994). Moreover it is important to avoid making assumptions about causation from correlational studies. Deaf children for example, also show problems in certain aspects of sequencing but no-one would suggest that these were the cause of their hearing impairment. Thus it may well be that the observed processing deficits are the result of the language disorder rather than the cause (Leonard, 1987). In Tallal and Piercy's tasks the child had to process and make judgements about the similarities or differences between the stimuli. This in itself requires metalinguistic skills and an underlying language problem could affect the ability to perform this type of task

The cognitive deficits described above have all either been presented as being concomitants of certain types of language disorder, or, as in the case of auditory rate processing, as being the underlying cause of the disorder. Other theories put forward to account for the language deficits in children with developmental language disorders include a specific defect of auditory perception; impairment of rhythmic ability, and a specific linguistic-system impairment (see Cromer, 1991 for review, pp 259-282). At the opposite extreme is the argument put forward by Leonard (1987) who suggests that developmental language disorders do not have a specific cause. They simply represent the low end of normal variation in language abilities.

The findings above are all rather piecemeal but an integrative and comprehensive hypothesis was presented by Bishop (1992). She suggested that the fundamental deficit in developmental language disorder is a slowed rate of information processing. This leads to impairment in any task that requires the integration of rapidly presented stimuli. Information presented through the auditory channel tends to be more fleeting and sequential in nature and so auditory perceptual problems are of particular significance, leading to problems in phonology and syntax. Visually presented information, on the other hand, tends to have a longer life and so does not require such rapid processing although there may still be an impairment and, as indicated above, some studies have found visual sequencing to be impaired in language-disordered children. The underlying deficit therefore affects not just auditory perception, but also the processing of stimuli from other modalities. The consequences are disproportionately severe, however, in the auditory channel because of the speed required for auditory processing. Since language entails rapid processing of auditory information this results in language development suffering more severely than other aspects of mental development. Information processing crosses various content domains and as such this hypothesis can be seen as reflecting a 'horizontal modularity' approach. It does account for some of the non-linguistic impairments that are found in developmental language disorders, but other problems such as those discussed below are not so easily explained in such terms.

Links between language impairments and behavioural disturbances

There have been numerous cross-sectional studies attesting to the raised frequency of psychopathological problems in children with developmental disorders of speech and language. The initial findings on associations between language delay and psychosocial disturbance stemmed from cross-sectional studies of *clinic samples* - either of children referred for speech or language difficulties (Cantwell, Baker and Mattison, 1979; Caulfield et

al., 1989; Crookes and Green, 1963; Fitzsimons, 1958; Lindholm and Touliatis, 1979; Mykelbust, 1954; Solomon, 1961; Trapp and Evan, 1960), or those seen for psychiatric problems (Chess and Rosenberg, 1974; Cohen, Devine and Meloche-Kelly, 1989; Wing, 1969). These were followed by epidemiological studies that confirmed the association was not simply a consequence of referral biases (Beitchman et al., 1986; Beitchman, Peterson and Clegg, 1987; Drillien and Drummond, 1983; Fundudis, Kolvin and Garside, 1979; Jenkins, Bax and Hart, 1980; Silva et al., 1984; Stevenson, Richman and Graham, 1985). There are considerable difficulties in interpreting the findings from these studies as they have varied greatly in their definitions of developmental speech/language disorder and in their measures of psychopathology. The ways in which data are collected, for example, can influence findings. This is illustrated by Caulfield et al. (1989) who found behavioural problems on observation that were not evident from parental reports. Nonetheless, despite these difficulties the overwhelming finding from the majority of investigations has been that children with developmental speech and language disorders have a raised rate of psychopathology.

In a Canadian study, Beitchman et al. (1986) found that amongst 1,655 5-year olds, 11% had a speech or language disorder, and on clinical examination 48.7% of these showed some psychiatric disorder (using DSM-III criteria), particularly attention deficit disorders and emotional disturbances. The most comprehensive investigations, however, have been the Los Angeles series of studies (Baker and Cantwell, 1982; Cantwell et al. 1979; Cantwell and Baker, 1983). These investigators took consecutive cases referred to a clinic for speech and language disorders and then carried out full psychometric and psychiatric evaluations. Of the first 100 children to be investigated in this way, 53 received at least one psychiatric diagnosis including attention deficit disorder, oppositional disorder or anxiety disorders. Similarly, in the Dunedin epidemiological study Silva et al. (1984) found a significantly raised rate of teacher-reported problems in the group with delayed speech and a normal-IQ, as compared with the sample as a whole. The increase on the parent scale, however, fell short of significance. Social difficulties seem to be a common problem and both Fitzsimons (1958)

and Solomon (1961) found higher rates of peer relationship difficulties and anxiety symptoms in clinic case-control studies. Ingram (1959) also reported that psychiatric problems in this language-disordered group mainly consisted of social difficulties or anxiety disorders. Taking all the available data into account, the main types of psychopathology associated with developmental language disorders appear to be anxiety-related symptoms, social difficulties and attention-deficit problems. Conduct disturbances and antisocial behaviours do not appear to be so strongly associated.

The finding that there are increased rates of psychopathological problems in language-disordered children raises fresh questions about what underlies the pattern of impairment. The problems associated with developmental language disorders cross the boundaries between cognitive, linguistic and socio-emotional activities and it is unclear why this should be. There has been scarcely any research into the mechanisms underlying these psychopathological associations but two reviews (Cantwell and Baker, 1977; Howlin and Rutter, 1987) suggested several that need consideration.

One explanation might be that there is an underlying deficit in a purely linguistic process. Learning to use language certainly transforms a child's intellectual life and the way in which he or she socialises, and it could be argued that problems in language development are likely to affect these areas adversely. Within this category of explanation, where the socio-emotional difficulties are viewed as secondary consequences of the language disorder, two rather different mechanisms have been proposed. Firstly, speech/language disability may predispose to social or emotional problems because of the child's difficulties in communication or because language oddities increase the risk of social rejection. There is evidence that children who are identified as being different from their peers are more likely to be perceived as less socially acceptable by their teachers and peers (Bradfield et al., 1973; Meyers, MacMillan and Yoshida, 1975), and, in being different become more prone to teasing (Corman and Gottlieb, 1978). A second route to the socio-emotional difficulties may be through the scholastic problems which themselves create their own risks. It is relatively

easy to suggest reasons why the association between language retardation and educational difficulties should be particularly strong. Progress in schools relies heavily on the ability to read what is presented in the written mode (Howlin and Rutter, 1987) and difficulty in interpreting this type of material is likely to result in the child falling behind. At another level, educational failure can lead to low self-esteem, and poor self-image is known to influence behaviour (Harter, 1983).

A second explanatory category proposes that in some cases, common antecedents might explain both the language delay and the associated psychopathology. Such antecedents include temperamental difficulty, family disadvantage and psychosocial deprivation. If a child is especially temperamentally difficult, for example, caregivers may reduce the time they spend with him, thereby in turn reducing the amount of reciprocal communication that he experiences. Temperamental difficulties are also likely to predispose the child to certain behavioural and educational problems because of short attention span, hyperactivity, reduced resilience and greater susceptibility to the usual stresses of growing-up. Nonetheless, whilst this type of mechanism might account for some of the less severe language delays it seems unlikely to explain the more severe mixed receptive-expressive language disorders that have been described above.

Another antecedent that has been proposed is an underlying neurodevelopmental delay. Tallal, Dukette and Curtiss (1989) assessed 4-year old children using the Achenbach Child Behavior Checklist and found that descriptions such as 'clumsy', 'confused' and 'can't concentrate' differentiated language-impaired children from controls. The fact that these behavioural abnormalities are associated with attention, perception and motor functions led to the suggestion that an underlying neurodevelopmental delay could account for both the language handicap and many of the associated behaviour problems in language-impaired children. This was an interesting proposition and may account for some of the associations in language-disordered children, but it failed to account for the finding that in boys 'cries too much' and 'clings to adults' also differentiated the groups, and in girls 'withdrawn', 'secretive'

and 'compulsions' did so (Rutter and Mawhood, 1991). It also lacked the scope to explain why poor peer relations and anxiety-related symptoms should be so common in language-impaired children.

In addressing the issue of whether the psychosocial risk stems from an underlying neurodevelopmental or cognitive impairment it would be informative to have data on children who have developmental disorders that are not language-based (e.g. perceptual-motor disorders). If such children were found to have similar psychosocial risks to those associated with developmental language disorder it might reasonably be deduced that the pattern of risk was determined by the postulated neurodevelopmental or cognitive impairment rather than by the language deficit per se. There do not seem to be any investigations that have directly compared language disorders with perceptual-motor (or other non-language) developmental disorders, but there are some limited data from studies that have looked at the associated problems of single diagnostic groups. Studies of clumsy children (Gordon and McKinlay, 1980; Henderson and Hall, 1982) have not shown any marked increase in reading difficulties. Also the Rourke and Strang (1983) studies of mixed groups of learning-disabled children showed that those with reading difficulties tended to have verbal deficits, whereas those with mathematical difficulties tended to have visuo-spatial deficits. It seems from these studies that the pattern of educational risk associated with language disorder is probably different from that found in developmental disorders of non-language functions, but more data are clearly necessary. With regard to the behavioural risks, Rourke (1988) compared verbal and visuo-spatial varieties of learning disability, and reported that socio-emotional disturbances involving anxiety and depression were more commonly associated with the latter type. The possibility that the psychopathological sequelae of specific developmental disorders vary according to whether language or visuo-spatial functions are involved warrants further study.

A third category of hypothesis proposes that the language delay and the social impairments both constitute an intrinsic part of the language disorder. This might be viewed in modular

terms so that the various affected areas all function together as part of the same horizontal module with all areas being affected when there is damage.

There is at present a lack of adequate data to test these competing alternative explanations, although it may be assumed that no one mechanism is likely to explain all the psychopathological associations. The important issue of underlying mechanisms will be revisited and extended in Chapter Two.

Leaving aside the issue of causality in developmental language disorders, for the time being, it is clear from the above discussion that many cognitive and socio-behavioural difficulties are associated with certain types of language disorder, and we can now return to the original question of whether the deficits found in autism can be explained in terms of the children's language impairment or whether they extend beyond these functions. That is, - is autism simply an extreme form of language disorder?

A comparison of autism and developmental language disorder

Bartak et al. (1975) addressed this last issue and, in order to focus on the role of language impairment in autism, they compared two groups of subjects - one comprising children diagnosed as autistic and the other consisting of children with a developmental mixed receptive-expressive language disorder. This latter group was chosen because, as discussed earlier, such children tend to show many problems similar to those found in autism. An important element in the design of this study, neglected in many earlier studies (see Hingtgen and Bryson, 1972), was to control for the level of cognitive development, as children of low IQ may show a different pattern of difficulties to those of higher IQ. A great variety of cognitive deficits MAY be present in autistic children, but the key question needed to be 'what deficits MUST be present if autism is to occur?' Consequently only children of normal non-verbal intelligence were included in the study, since their profiles were not complicated by mental retardation or associated handicaps.

All children were assessed using a variety of psychological tests to investigate verbal and non-verbal cognitive ability, receptive and expressive language, reading and social competence. In addition both parents were interviewed separately to obtain a detailed history of the child's language and social development; an account of current patterns of communication between the child and his family; a family history of speech delay, and a description of the child's current social behaviour.

The main findings of the study were that although there were many similarities between the groups (e.g. abnormal or diminished babble; inconsistent response to sounds in early development; abnormalities in syntax and intonation, and also in word-use and understanding) there were also important differences between them, and the autism group were significantly more handicapped in a number of ways. The only area in which the children with developmental language disorder were more impaired was in articulation skills.

The groups had a similar performance IQ on the WISC scale but the autism group were worse on the sub-tests that were most highly verbal (i.e. comprehension, similarities and vocabulary). Their language comprehension overall was more seriously impaired, and echoing and pronominal reversal were more common. They produced more stereotyped utterances, chatted less and generally failed to use their language for social communication. In addition, very few showed imaginative play and they were also impaired in their use and understanding of gesture. In summary, the findings indicated that in autism the associated deficits were more profound and more extensive than in the language-disordered group. Moreover, there was an impairment in the use of language that could not be explained simply in terms of language delay; their language development was not only delayed, it was deviant as well.

With regard to other aspects of behaviour that were assessed in this comparison, it was found that the autism group were much less socially developed, in that they had very few friends and rarely engaged in co-operative play. They also showed greater behavioural disturbances in public situations, often to the extent that family activities became limited, and they had particular difficulties in adapting to new situations. Some of the children with developmental language disorder showed certain autistic characteristics, but discriminant function analysis demonstrated that the group differences were significantly large and clear-cut for the groups to show little overlap when the total pattern of characteristics were taken into account (Bartak, Rutter and Cox, 1977). There was, however, a small group of children who were described as 'mixed' (for want of a better term), in that they showed some autistic symptoms but these were insufficient to warrant a clear-cut diagnosis of autism.

The main task undertaken by this study was to clarify the essential deficit in autism, and these results demonstrated that a disorder of receptive language could not on its own be enough to account for autism since many of the language-disordered group had a severe defect of receptive language but were not at all autistic. Nevertheless, whilst the two main groups were quite different, the existence of the mixed group suggested some unexplained

overlap between the two conditions. This study represented a significant advance in determining the nature of the underlying deficit in autism but it left open a fundamental question. Did the autism group differ from the language-disordered group because their language impairment was wider and deeper and therefore more likely to affect other areas of development? Alternatively, does the primary deficit in autism extend beyond language? This is a very similar question to that posed earlier in relation to the underlying deficit in developmental language disorder and will, like that one, be returned to in later chapters.

There have been other comparative studies of autism and developmental language disorder, but differences in the defining criteria of the two disorders have frequently made it problematic to draw conclusions (von Tetchner and Martinsen, 1981). A study by Lincoln et al. (1988), however, was useful, and their findings were similar to those of Bartak et al. High-functioning 8-12 year old children with autism were found to have language abnormalities and cognitive difficulties that were more severe, more widespread and different in pattern from differences found in children diagnosed as having receptive developmental language disorders.

One of the limitations of the study by Bartak and his colleagues was that it only explored the more superficial aspects of language (i.e. phonology and syntax). More recent research has focused on pragmatic and semantic deficits in autism and there has been a growing awareness of the important role that these aspects of language might play in the syndrome. Alongside the increased knowledge of the specific sub-systems of language, continuing research has allowed the social deficits found in autism to be described ever more precisely, and this has led in turn to new areas of interest, and subsequently new hypotheses on the nature of autism.

MORE RECENT ATTEMPTS TO DESCRIBE THE DEFICIT

The two sections that follow summarise the main findings on language and social functioning that have taken place since Bartak and his colleagues carried out their research. The third section summarises two recent hypotheses that have developed out of these new findings. What marks them out as important is that they both attempt to describe the deficit in autism in ways that, for the first time, integrate the observed social and linguistic deficits.

ASPECTS OF LANGUAGE FUNCTIONING

Phonology

In general, studies that have looked at phonological development in children with autism have found them to be little different in this respect from normal or retarded children (Bartolucci et al., 1976; Eisenberg, 1956; Pierce and Bartolucci, 1977). Boucher (1976) reported data showing that the articulation of children with autism, whilst delayed was actually superior to matched, learning-disabled controls. She concluded that articulation ability represents a peak in the language performance profile of autism, and the general conclusion here is that children with autism do not suffer from a phonological deficit at the level of segmental phonology.

The use of suprasegmental features such as stress and intonation, however, are often described as markedly unusual in children with autism. This does not seem to be a problem of either perception or production since Tager-Flusberg (1985) demonstrated that they can imitate the stress patterns of individual words, and Frith (1969), in a memory experiment, found children with autism were similar to a normal control group in that they recalled stressed words in a sentence better than unstressed words. Although individuals with autism appear to be capable of normal stress and intonation patterns, the way in which they use

prosody appears to be deviant. Baltaxe and Simmons (1985) noted that children with autism tend to stress function words (e.g. conjunctions, prepositions) rather than content words (nouns and verbs) and this is one factor contributing to the odd quality of their speech. Research by Fine et al. (1991) compared patterns of intonation use amongst subjects with Asperger's syndrome, high-functioning autism and psychiatric out-patient controls. The major finding was that the high-functioning autism subjects used useful patterns of intonation for communication less often that the other two groups. The authors suggest that the misuse could be due to a failure to assess contexts correctly so the messages that are sent do not match the information states of the hearers. Other suggestions are that there is a problem in mapping intonation patterns onto contexts or alternatively a failure to understand the communication value of specific intonation patterns.

Syntax

Most of the available evidence relating to syntactic development suggests that in autism the grammatical aspects of language are in keeping with the child's general level of language development (Tager-Flusberg, 1981a), although whether syntactic development in children with autism follows the same pattern as in normal children remains uncertain (Howlin, 1984). There is also an indication from a study of adults with autism that their syntactic development may eventually reach a plateau (Paul and Cohen, 1984). Adult subjects with autism were found in this study to perform significantly more poorly on measures of syntactic production in free speech than retarded controls matched for non-verbal IQ.

Semantics

Turning to semantic deficits, Simmons and Baltaxe (1975) analysed word use by adolescents

with autism, gathered during a structured interview. They found that the most frequent errors involved violations of semantic constraints (e.g. idiosyncratic semantic usage as in 'he thinks when he wants to please *it's like an elephant*'; vagueness of referent as in Q: What are you planning to do? A: *Just looking ahead in the future for all I care*; inappropriate word use as in 'The loopholes can be *livid*'). In one of the few experimental studies of language comprehension in children with autism, Tager-Flusberg (1981b) found that overall sentence comprehension was lower amongst children with autism than in normal controls matched for non-verbal mental age. Normal subjects and those with autism were similar in their use of a word-order strategy for processing sentences (e.g. interpreting noun-verb-noun sequences as agent-action-object). Where the autism group appeared to have difficulty was in using a semantically-based probable event strategy of interpreting sentences based on their likelihood of occurring in the real word. For example, "The girl feeds the baby" is a likely event, whereas, "The baby feeds the girl" is relatively unlikely. Such strategies allow a child to integrate linguistic input with knowledge of the real world, leading eventually to the comprehension of more advanced structures, and Tager-Flusberg suggested that difficulty in achieving this sort of integration may be one of the fundamental deficits in autistic language. Later experiments by the same author (Tager-Flusberg, 1985) indicated that there are certain aspects of semantic knowledge in autism that do not differ from that of controls matched for mental age. Fourteen children with autism and near-normal non-verbal IQ's were shown pictures and asked to identify whether these were members of a particular verbal category (e.g. bird). The autism group performed no differently from retarded and normal age-matched controls. Tager-Flusberg suggested that the semantic difficulty lies not in a failure to represent word meaning in memory, but rather in a failure to use meaning in the normal way in retrieval or organisational tasks.

Pragmatics

Perhaps the most significant area of deficit, however, is in pragmatic competence. Prior to the work of Baltaxe (1977) this had not been given serious consideration but her research was important in highlighting the pragmatic deficits found in autism. She pointed out that not only must a child acquire grammatical skills, these must be *used* in a face-to-face social interaction. The development of communication skills, therefore, is not only tied to cognitive development but also to the acquisition of social norms. Bearing this in mind, the acquisition of pragmatic skills, in which a child learns to use language appropriately in different social situations, can be understood as the interface between social, cognitive and linguistic development. Baltaxe analysed language samples from 5 autistic adolescents ranging in age from 14 to 21 years and found that three areas of pragmatic deficit characterised her subjects: - (1) impairments in the speaker-hearer role relationship, so that there is difficulty in adapting to the different discourse roles, (2) apparent lack of understanding of the rules of conduct governing a dialogue (e.g. saying things that in the circumstances would be considered impolite, but without any apparent intention to be rude), and (3) in differentiating new and old information (e.g. not using fully specified noun phrases and indefinite articles to introduce new information). Studying this adolescent group emphasised that difficulties in pragmatic competence become more obvious as the child gets older. The main reason for this is that the language used becomes more sophisticated with age and subtle deficits are seen to surface.

Another pragmatic study, this time an unpublished dissertation by Ball (1978), compared spontaneous speech samples obtained from 5 normal children; 5 with developmental aphasia and 5 with autism, all matched for verbal mental age. She focused on the use of speech acts and discourse rules and found that the autistic subjects were significantly less advanced than the other two groups. They used a more limited range of speech acts and their understanding of discourse rules (e.g. the illegality of non sequiturs) was much poorer.

Wetherby and Prutting (1984) also found that children with autism showed a reduced range of speech acts. They requested objects and actions more often than normal children, and protested more, but on the other hand they did not use language to request information; show off; comment, or acknowledge others.

Further evidence came from Dewey and Everard (1974) who carried out a letter survey with parents of individuals with a mild degree of autism. Parental reports revealed a number of communicative difficulties. The most common ones were a high degree of non reciprocal speech; failure to listen; irrelevant comments; failure to leave a topic of obsessive interest, and failure to look for cues in the listener as to his or her level of interest or desire to take a turn.

In a more specific study Paul and Cohen (1984) investigated the response to requests for clarification in 8 autistic adults and 8 retarded adults matched for non-verbal IQ. They found that both groups were equally likely to respond to the request for clarification, but those individuals with autism were less likely to add additional information that might be of help to the listener. Although they attempted to respond to the listener's need they seemed to have difficulty judging which piece of information was relevant.

In summary, the studies of pragmatic skills in verbal individuals with autism indicate that there *is* a basic intention to communicate. What they have difficulty with, however, are communicative situations involving joint reference of shared topics, as well as in supplying new information relevant to the listener's needs. Thus they appear not to conceive of language as a means of communicating to others what they do not currently know (Tager-Flusberg, 1994). There is also difficulty in inferring the interlocutor's implicit intentions, and

the strategies used for maintaining conversation are less advanced than syntactic ability would predict.

All the investigations described here have used only a small number of subjects and a relatively small number of structures have been studied. Caution should therefore be taken in interpreting the findings, but nonetheless there is reasonable evidence to suggest that in autism the main areas of linguistic deviance lie in pragmatic and semantic functioning. These are the two domains of language, as Sigman et al. (1987) observe, that are most closely tied to representational thought and communication.

Developmental changes in language functioning

As well as examining the findings on specific aspects of language functioning it is important to consider the findings on how language development *progresses* in children with autism. In general, most are late in starting to speak, and develop speech at a retarded rate. Most samples have found that between 30 and 50 per cent of children with autism remain mute (Lotter, 1967; Mittler et al., 1966; Rutter, 1966), and for these the prognosis tends to be poor. It has already been noted earlier that the presence of useful language at age 5 years is a strongly positive predictor of outcome. Paul, Cohen and Caparulo (1983) in a 10-year longitudinal study of children with autistic and aphasic disorders found that the children who had the best comprehension abilities when first studied were more likely to make progress in the depth and maturity of their social relations, regardless of the status of social skills at their initial assessment. In another report on the same population, Paul and Cohen (1984) suggested that whilst both expressive and comprehension skills continue to improve through adolescence and into adulthood, the greatest rates of improvement are found in expressive skills, possibly because speech is more often a direct target of remedial efforts.

Evidence from formal intelligence testing also reveals interesting developmental changes. DeMyer et al. (1973) studied 135 children with autism, and a mean age of 5.3 years, and found that their performance IQ's were higher than their verbal IQ's. This was an expected finding given the language difficulties experienced by the group. More interestingly, however, there are suggestions from studies of older age-groups (Kanner and Eisenberg, 1955; Simmons and Tymchuk, 1973) that many high-functioning individuals with autism improve in their verbal IQ scores and may even have better verbal than performance scores as they grow older. Where they continue to do poorly is on subtests that require social judgement or integration of information, rather than verbal memory alone (e.g. comprehension and arithmetic). Thus, despite improvements on verbal IQ measures with age, the social use of language is still likely to be impaired, and in order to understand better how the language and social deficits may be related it is necessary to turn to the findings on social functioning in autism.

ASPECTS OF SOCIAL FUNCTIONING

Developmental changes in social functioning

Below the age of 5 years there are generally gross social impairments, especially in the relative failure to develop specific attachments. After the age of 5 years, although some of the more evident social impairments may improve, serious social impairments tend to continue (Lord, 1984). McEachin, Smith and Lovaas (1993) did suggest that very intensive behavioural intervention could produce a good outcome in children followed-up at a mean age of 11.5 years, but by far the majority of the long-term follow-ups have reported that social impairment in autism appears to be lifelong. Newson, Dawson and Everard (1984) found persisting social difficulties in able autistic adults as did Dewey and Everard (1974). Kanner (1971) in a 30-year follow-up of his original group found that the levels of functioning

ranged from complete deterioration to 'occupational adequacy'. Two subjects had done well in this latter respect; one was working as a bank teller and the other as a duplicating machine operator. Even for these subjects, however, there were problems of social functioning and they were described as having ' a limited though superficially smooth social adjustment'.

In another follow-up, Rumsey, Rapoport and Sceery (1985) studied 14 adult males with autism, 9 of whom were unusually high-functioning. Some of these had formed part of Kanner's original sample. Only 1 reported having any current friendships and none were married or contemplating the prospect. Most could take part in social activities that were organised by others but they had difficulties maintaining relationships when the external organisational structure was absent. Some desired friendships, but lacked social competence; others seemed to lack any social motivation at all. There was also evidence that many behaved inappropriately in social situations, showing highly stereotyped or inappropriate social behaviours including repetitions of a fixed script when meeting people and inappropriate touching of people's clothing. Frustration and an inability to cope with environmental demands (e.g. pressure induced by having to make independent decisions, or trivial frustrations such as a lack of soap in the bathroom) were also common triggers of aggression, destructiveness or stereotyped movements such as arm-flapping. Language functioning in the group ranged from normal to complete mutism, but the most common abnormality, especially in the high-functioning group, was in the social use of speech. Few lived independently and only 4 of the 9 high-functioning subjects were independently employed. All of these were in routine jobs with limited decision-making and minimal social interaction.

Venter et al. (1992), followed-up 22 high-functioning subjects over 18 years of age. None had married, but 2 lived on their own, one independently and the other with a good deal of parental support and practical help. One subject had completed a university course. The

general finding was that a great deal of work was necessary on the part of parents and professionals to help young adults with autism find the least restricted environment in which they could cope. The best current predictor of both academic achievement and adaptive scores was verbal IQ (r_S = 0.70). Speech before 5 years, PPVT scores and parental report of the severity of restricted, repetitive behaviours were all early predictors of adaptive and achievement outcome. Neither performance IQ (Wechsler tests) nor non-verbal IQ (Raven's Matrices) were especially strong current predictors of outome, but early non-verbal IQ (from the Merrill-Palmer or Leiter) showed a consistent relationship with the outcome measures. This study found a stronger academic outcome than indicated in many other studies, and the authors suggest that the expansion of social, vocational and residential support services in the community in North America may have been responsible for this.

Several other researchers have reported a poor social prognosis in autism (e.g. Gillberg, 1991; Rutter et al., 1967; Wolf and Goldberg, 1986), and even in a study that purported to describe 2 autistic individuals who had 'recovered' by the age of 8 years, (Gazjago and Prior, 1974), there were clear and persisting social abnormalities. These included difficulties such as awkwardness in group situations; behaving in a socially embarrassing way, and having a poorly developed sense of sympathy and understanding of other people's feelings.

The findings from a study by Szatmari et al., (1989) did suggest a more positive outcome than that found in other studies, but the results should be treated with caution since it is unclear to what extent their sample was representative of high-functioning autistic individuals in general. The subjects in this study all came from higher socio-economic status families who had advocated forcefully in favour of their child's best educational interests, and it is not clear whether this may have been an important prognostic factor. The authors found that the majority were functioning poorly in terms of occupational-social outcome, but 4 of the group of 16 had a very good outcome, and were described as having made a 'recovery'. One had married and the other 3 had dated regularly and even had long-term relationships. Five were

living independently and 8 of the 16 had gone to university or college, with 7 eventually obtaining university degrees. The authors concluded that recovery may not be complete, but that nonetheless substantial recovery can occur.

Socio-emotional functioning

In recent years there has been a growth of interest in aspects of socio-emotional functioning. It is well-established that individuals with autism often fail to understand what others feel or think (Bemporad, 1979; Dewey and Everard, 1974; Gazjago and Prior, 1974) and an area in which they appear to have particular difficulty is in the interpretation of emotions when different modalities (i.e. facial, vocal and gestural expression) are involved. They seem to have difficulty in recognising how different expressions of particular emotions are associated with each other and this might contribute to their failure to understand the emotional states of other people. Hobson (1986, a and b), in a series of experiments, investigated the ability of children with autism to match facial expressions portraying emotions to gestures, vocalisations and contexts characteristic of those emotions, and also to select appropriate emotional gestures for various facial expressions and vocalisations. Children with autism were found to be impaired on those tasks involving the recognition of emotions, when compared with normal and non-autistic retarded children. There is also evidence that affective stimuli carry less significance for autistic people. Jennings (1973) gave children with autism a task in which they had to sort photographs of faces and found that they preferred to sort them according to non-affective stimuli, such as hats. The matched controls preferred to sort by facial expression. If specifically instructed to sort just by expression, however, they *were* able to do so.

In addition to the apparent difficulties in comprehending emotions, clinical descriptions of the way in which autistic individuals *produce* emotions suggest abnormalities. Langdell (1981) found that the attempts of children with autism to produce happy and sad faces were rated by judges as poor. Macdonald et al. (1989) studied high-functioning adults with autism and found that they were relatively impaired in both the appreciation and production of emotional expression when compared with normal adults.

A deficit in emotional recognition cannot be said to be diagnostic of autism since not all autistic individuals show it. Moreover, similar deficits are to be found in conditions such as schizophrenia and mental retardation as well as amongst physically abused children. Rutter (1991) suggested that what may be more specifically autistic is not an impairment in emotion recognition as such, but rather an atypical way of processing socio-emotional stimuli. Individuals with autism often show special skills in recognising material presented in an unusual way (such as upside-down faces), and this type of skill has not, as yet, been found in any other diagnostic group.

Conceptual role-taking

Another area of social understanding in which there appears to be a deficit is in conceptual role-taking, specifically in attributing different beliefs to others. Baron-Cohen, Leslie and Frith (1985) investigated the ability of children with autism to attribute beliefs to others if these were different from those they knew to be true themselves. They were asked to predict where a person would look for an object if it was moved from a previous location whilst the person was out of the room, and were significantly impaired in this when compared with control children. This was seen as a failure to attribute different beliefs to others, or to use a 'theory of mind', an approach which came initially from experiments with primates (Premack and Woodruff, 1978). Other experiments have found similar results using a picture-

sequencing paradigm[2] (Baron-Cohen, Leslie and Frith, 1986) and a gift-choosing paradigm[3] (Dawson and Fernald, 1987).

These findings taken together indicate that the social impairments of individuals with autism are most profound in those areas that require knowledge of other people. They are not so deficient in very simple social interchanges, but show their greatest difficulties in that very critical area of social knowledge - the recognition that other people have thoughts and feelings of their own (Sigman et al., 1987).

HYPOTHESES THAT ATTEMPT TO ACCOUNT FOR THE SOCIAL AND LINGUISTIC DEFICITS

It is clear from the descriptions above that there is a particular profile in autism, with the impairment affecting specific social skills, and pragmatic skills. Several different schools of thought have emerged in recent years, attempting to explain the psychological mechanism responsible for this profile of impairment in the social and linguistic domains. One point of view is that the basis of the deficit in 'knowledge of others' lies in a disorder of the affective system. Hobson (1989) and others (e.g. Fein et al., 1986) have argued that in autism there is an innate inability to enter into emotional touch with other people, and that most of the other features of autism derive from this disability. The child is unable to participate in social experiences and fails to recognise the feelings and thoughts of other people. Hobson (1989) also viewed this lack of interactive experience as instrumental in causing the child's difficulties with abstraction and symbolisation. In normal development there is 'interpersonal negotiation of meaning' in which the experience of the dyad is central, and through which the child learns, for example, that he may call something by different names. A child who is not

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[2]This study investigated the child's ability to arrange pictures into a predetermined sequence. This was taken to indicate the child's understanding of the story depicted in the sequence.

[3] A range of materials was placed in front of the child who was asked to choose one as a 'gift' for a range of different people. Scoring was based on the age-appropriateness of the choice made.

able to participate in these experiences will.find it difficult to see the world objectively rather than subjectively. A failure to connect things with one another, according to similarities in experiences of each, will lead to deficits in the capacity to abstract, and also to construct knowledge of other people. According to this hypothesis the greater part of the characteristic cognitive and language disability in autism is seen either as stemming from such impairments in the capacity to symbolise, or as reflections of those lower-order deficits that have a particularly intimate relationship with affective or social development.

A second group of theorists (Baron-Cohen, 1990; Leslie and Frith, 1990) have proposed a primarily cognitive explanation for the social impairment found in autism. The basic deficit is seen as being a lack of a 'theory of mind'. Like the 'affective' theory this approach considers the autistic child's difficulty in understanding other people's mental states as central. In contrast, however, it starts from the premise that mental states are not directly observable but have to be inferred, and this inference requires a complex cognitive mechanism (Baron-Cohen, 1988).

Baron-Cohen (1989) suggested that a precursor to an impairment in the child's 'theory of mind' may be observed in deficits of pointing behaviours. He found that children with autism were not impaired in protoimperative pointing (i.e. pointing in order to get another person to obtain an object), but they did show difficulties with both the production and understanding of protodeclarative pointing (i.e. pointing in order to make the other person recognise, attend to or understand what he/she is thinking about). This latter category of pointing is intended to influence the other person's mental state and therefore requires a basic theory of mind. Certainly in normal infants it is well-established that communication is developed through the establishment of joint attentional routines with parents (Bruner, 1975), and these gradually evolve into acts of preverbal communication (Bates, 1976) that function as a comment on a shared topic. Paul (1987) suggested that the delays in language acquisition found in children with autism might stem from an inability to understand the need to learn such a system for

establishing and elaborating joint reference. The deficit in protodeclarative pointing described by Baron-Cohen is an example of a particular way in which joint reference fails to be established. The pragmatic difficulties in autism have already been referred to, and there is a particular failure on the part of the autistic individual to communicate what the interlocutor does not already know, and needs to know in order to understand what is being said. In the context of this theoretical stance these omissions can be explained as resulting from a lack of theory of mind. In contrast it has also been described earlier that children with autism do not generally appear to show particular deficits in acquiring structural aspects of language, and it could be interpreted that these are the ones that are less dependent on 'theory of mind' abilities (Tager-Flusberg, 1994).

The theory of mind interpretation of autism is attractive, but there are nonetheless some aspects of the syndrome that it has not been able to explain adequately (see Rutter and Bailey, 1993). This criticism applies, for example, to the persistence of abnormal language forms such as metaphorical language, delayed echolalia and neologisms. Rutter (1987) has observed that these abnormal instances of word-use may be functionally similar to the kinds of early errors in word meaning made by young, normally developing children. What defines them as abnormal in autism, however, is their persistence. He suggested that one of the reasons these forms persist in autism is that the children are insensitive to, or find it difficult to make use of, corrective feedback from their parents because of the social impairments that they experience. It is not clear as yet how far the failure of feedback processes can explain the persistence but it is plausible that they play at least some role.

The affective and cognitive explanations both represent significant advances in understanding autism because they have attempted to integrate the nature of the language impairment with other aspects of the syndrome. They differ fundamentally in their concept of

what constitutes the primary deficit but they do agree that the deficit is highly specific.

In keeping with this hypothesis of a specific narrow deficit, a group of researchers have recently sought to get rid of the classification concept of 'pervasive developmental disorder' on the grounds that the disorder is not necessarily pervasive[4] (Baird et al., 1991). They have argued that they constitute disorders in which there are *specific* deficits in social/cognitive functioning. The pervasive label is *most* inappropriate when applied to high-functioning individuals with autism and they may be classified more appropriately as coming within the specific developmental disorder category.

Goodman (1989) argued *against* the search for a 'unitary' psychological or neurological explanation for the origins of autism and instead put forward a theory of 'multiple primary deficits'. According to this theory the parts of the neural system underlying social ability, for example, may share a common vulnerability with that underlying certain language skills. Damage to the system may therefore result in deficits in both areas of functioning and this could apply as much in autism as in certain other conditions such as Asperger's syndrome and the developmental language disorders.

Various other researchers have also argued against the specificity of the deficit in autism (Ozonoff, Pennington and Rogers, 1991; Rutter and Schopler, 1992; Volkmar and Cohen, 1991a) and recently there have been two new research initiatives that have taken a broader perspective in characterising the disorder. Firstly there has been a body of findings resulting from research into general difficulties in high-level planning and control of behaviour. Ozonoff (1994) reviews this research into *executive dysfunction* and the major findings have been that individuals with autism have difficulties in cognitive activities such as planning and

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[4]In this context, 'pervasive' indicates the extent to which the behavioural, cognitive, language and social spheres of life are affected.

organization, in using feedback and in shifting between cognitive sets. Whereas this research thread has focused on the production aspects of cognition, a second broad cognitive model is more concerned with aspects of input. The *central coherence hypothesis* (Frith and Happe; 1994) focuses on the tendency that normal individuals have to take account of context in interpreting situations. This tendency is impaired in autism so that information tends to be processed in parts rather than within its wider context. Shah and Frith (1983) found that autistic adolescents have a particular facility in seeing 'parts of wholes' and do very well on the Embedded Figures Test which requires the location of hidden figures within a larger picture. Normal people find this task difficult because of the tendency to see the 'gestalt' of the overall figure. A related finding would seem to be that individuals with autism are better at learning and recalling random strings of words than are normal people who find it easier when the words are linked by some meaning (Hermelin and O'Connor, 1970). It is common to find that individuals with autism have a particular performance peak on the Block Design subtest of the Wechsler Intelligence Scales. Shah and Frith (1993) found that individuals with autism showed a particular advantage at Block Design tasks where *segmentation* of the design was involved but they had no particular advantage when the task involved the perception of designs that had been put through various degrees of rotation. This suggests that rather than a general strength in visuo-spatial perception, the particular cognitive pattern of the individuals with autism lies in their ability to resist the strong pull of the 'gestalt' of the design, whereas normal people find this difficult. The modes of operation suggested by both these broader' approaches have implications for affecting behaviour in a range of different domains, including social functioning, perception and pragmatic behaviours.

One important question is how far the cognitive deficits proposed by these theories are specific to autism. Bailey, Rutter and Phillips (in press) review this issue and note that although difficulties in the perception and expression of emotion and in face-perception have been found in other disorders such as schizophrenia and mental handicap, the affect-related

deficits in autism may be of a different kind. With regard to the specificity of the theory of mind deficit this has not been found in any of the other groups so far tested, although there are indications that it may be present in children with conduct disorder and in schizophrenia. In the latter case, however, the suggestion is of a breakdown of *existing* functioning whereas what is prosposed in autism is a *developmental* failure of theory of mind. With regard to the specificity of executive dysfunction there is some difficulty since the term 'executive function' can include a variety of mental operations. Various of these have been found in clinical groups as disparate as childhood conduct disorder and adult schizophrenia, and more research is needed in order to determine how far, if at all, the executive deficits are specific to autism. Work is currently in progress to test the specificity of central coherence theory but there is some suggestion of specificity in that the performance peak in Block Design on the Wechsler Scales is so characteristic of autism.

Although the borderlines between these various approaches are rather cloudy, there is clearly some controversy between the different theoretical approaches described here, with some claiming that the condition has a more specific deficit than others. There is some scope for the theories to overlap, however, so that, for example, Frith and Happe (1994) view theory of mind deficit and weakness of central coherence as independent deficits, with the latter accounting for the more non-social aspects of the disorder. Bailey et al. (in press) give a very clear review of the extent to which the different theories are successful in accounting for the observed features. What stands out, however, from the follow-up studies of autism that have been described in this chapter is that even in adulthood, most individuals with autism continue to show abnormalities of behaviour, cognition, language and social functioning. Taken in the context of the varying viewpoints this finding raises an important question:- 'can autism really represent as specific and narrow a deficit as some have claimed?'

SUMMARY

In this introductory chapter a number of issues have been discussed concerning the nature of the underlying deficit in autism. Several theories have been put forward that attempt to bridge the social and cognitive deficits, and that account for the observed features of the syndrome with varying degrees of success. The topic of severe disorders of language development was introduced here initially because they had comparative value in addressing the question of whether the autistic syndrome is an extreme form of language disorder. Once it had been demonstrated that infantile autism and the developmental language disorders have clearly different features, that appeared to be the end of the story. Autism was classified as a pervasive developmental disorder and the language disorders continued to be viewed as highly specific. With time, however, new findings have cast a fresh light on these theoretical stances. As far as autism is concerned, some researchers have argued that the deficit is highly specific and that therefore the pervasive label should be abandoned. With regard to the developmental language disorders it has emerged that they may not be as narrow and specific in nature as was first thought. Cross-sectional studies have been fairly consistent in finding that associated cognitive, social, behavioural and educational difficulties are common. These issues that pertain to the underlying deficit in each disorder are complex and confusing. Nonetheless it is fundamental that they should be explored if we are to advance our understanding of these groups. In recent years there has been a growth of research in both areas and a range of data has come to light that suggests it would be valuable to reconsider the question of whether there are links between the two disorders. In Chapter Two these data are introduced and given consideration.

CHAPTER TWO: RECONSIDERING THE LINKS BETWEEN AUTISM AND DEVELOPMENTAL LANGUAGE DISORDERS

NEW DEVELOPMENTS

At the end of the previous chapter the idea of reconsidering the links between autism and developmental language disorders was introduced. A variety of new findings and approaches make it worth re-examining this question. These include: new developments in the classification of language disorders; a follow-up of Bartak's group into middle childhood; long-term follow-ups of children with developmental language disorders, and new findings on how autism and developmental language disorders might be subject to genetic influences. These issues are considered in this chapter before moving on, in Chapter Three, to define exactly which questions need to be addressed in the light of these developments.

SOME THOUGHTS ON TERMINOLOGY

New research and developments in classification have helped to clarify the relationship between autism and developmental language disorders and some research has suggested that the distinction between the two disorders is not always clear-cut. Wing (1976) pointed out that although it is relatively easy to diagnose a child with classic autistic disorder or a classic developmental receptive language disorder, there are many children who fall between the two and the borderlines are not at all clear. The children in the 'mixed' group described by Bartak et al. (1975) are good examples of such cases.

Apart from the difficulties presented by 'borderline' cases, terminology in this area has been a major cause of confusion and has led to misleading research results (Bishop, 1989). The diagnosis of 'developmental dysphasia' has traditionally been made by exclusion, turning it into a default term that is applied to children whose language difficulties do not fall within another diagnostic category. Consequently, a diverse range of linguistic manifestations have been encompassed under this single diagnostic label and use of one term carries the incorrect implication that there is a single aetiology and homogeneous characteristics. As Bishop (1992) observes, it may be unrealistic to look for a *single* underlying factor that can explain all cases of developmental language disorder. The rarity of some types of language disorder does make research problematic but, nonetheless, Cromer (1991) was optimistic that using certain exclusion criteria it is possible to obtain small numbers of subjects showing the same underlying difficulties and thus providing a homogeneous group.

There have been several attempts to develop more precise terminology. Bishop and Rosenbloom (1987), for example, described a specific developmental language disorder - 'semantic-pragmatic disorder'. The characteristics of semantic-pragmatic disorder include: verbosity; comprehension deficits; literal interpretation of utterances; perseveration; semantic paraphasias; lack of semantic specificity, and deficits in turn-taking and topic maintenance. These problems exist alongside speech that is usually fluent and adequately articulated. The child with this profile often has mild autistic features, although these are not severe or extensive enough to warrant a diagnosis of autism. Rapin (1987), using a very similar category, that she called 'semantic-pragmatic *syndrome*', found that there was significant overlap with autism, with 28 cases out of 35 meeting criteria for a diagnosis of autism. On the other hand the remaining 7 cases did not meet criteria, demonstrating that this language disorder can exist without extensive social and behavioural abnormalities. There is enormous potential for confusion in the use of these labels (Bishop, 1989). Bishop and Rosenbloom intend the use of 'semantic-pragmatic disorder' to be confined to children who do not have autism, whilst Rapin does not view semantic-pragmatic syndrome and autism as

mutually exclusive.

In summary, there seems to be considerable overlap between autism and specific types of language disorder. Outstanding difficulties remain, however, in the use of diagnostic labels. A variety of attempts have been made to devise measures that can discriminate adequately between sub-types of language impairment, but these have met with limited success (Bishop, 1992).

FOLLOW-UP INTO MIDDLE CHILDHOOD

A second development that raised new questions about the nature of the links between autism and developmental language disorders was a follow-up of the group originally studied by Bartak and his colleagues. This took place between 2 and 3 years after the initial study when the children were in middle childhood (Cantwell et al., 1989). Although the two groups tended to remain distinctive, and overall the autism group remained strikingly abnormal, there were a number of unpredicted findings amongst the group with developmental language disorder. These mainly related to their social functioning, so that despite their language having improved, a substantial proportion of these language-disordered boys showed increasing difficulties in peer relationships. For example, in the initial study, all of this group were said to have their own friends, but by follow-up nearly a third lacked friends and half failed to show appropriate participation in social groups. Half the group also failed to approach other children normally, whilst this had been true for only one subject initially. It was also noteworthy that a third were reported as failing to show sympathy. It was not at all clear why social relationships should have deteriorated in this group, given that their language was improving and this finding clearly warranted further investigation.

LONG-TERM FOLLOW-UPS OF CHILDREN WITH LANGUAGE DISORDERS

In addition to the findings from the study by Cantwell and his colleagues, there have been many other follow-up studies of children with specific developmental language disorders (see Rutter and Mawhood, 1991). In Chapter One a number of cross-sectional studies were cited, attesting to the raised rates of educational, behavioural and psychiatric problems in this group. What the follow-up studies have shown, however, is that such problems may persist long after competence in spoken language has been acquired.

Whilst this field of study has made many valuable advances over recent years, it has also been dogged by methodological problems that have made comparison between studies difficult (Rutter and Mawhood, 1991). Probably the greatest difficulties have arisen from the heterogeneity of the samples studied. This has led to some confusion in the literature with different studies obtaining contradictory results simply because they have used different populations of children (Bishop and Rosenbloom, 1987). Nonetheless despite these difficulties there has been a remarkable consistency in the general findings of studies that have examined the long-term sequelae of speech and language disordered children (Weiner, 1985).

Scholastic Risks

Many studies have confirmed the increased likelihood of children with a specific language disorder experiencing later scholastic difficulties, especially delays in reading (Aram and Nation, 1980; Billard et al., 1989; Debray-Ritzen, Mattinger and Chapuis, 1976; Fundudis et al., 1979; Garvey and Gordon, 1973; Griffiths, 1969; Ingram, 1963; Levi et al., 1982; Mason, 1967; Shriberg and Kwiatkowski, 1988; Silva et al., 1983; Stark et al., 1984; Urwin, Cooke and Kelly, 1988).

A number of important issues arise from this finding and one of these is whether the scholastic risk is mainly a function of general intellectual impairment, or a specific language deficit. It has been shown in epidemiological and clinical studies that much of the scholastic risk does stem from general intellectual impairment, but even so, reading difficulties do occur with an increased frequency when intellectual level has been taken into account. Thus, Debray-Ritzen et al. (1976) reported that in a sample of language-delayed children of normal intelligence, over two-thirds had reading difficulties. Stark et al. (1984) followed-up language-impaired children attending a special class and found that at 10 years of age, 23 out of 29 had reading scores at least two grades below age level. Aram et al. (1984) found that of 16 children with language delay and an IQ in the normal range, two-thirds had required special tutoring or had repeated one or more school grades by adolescence. Of the 11 with an initial IQ of at least 90, 5 were in the lowest decile for at least one subject out of reading, spelling and mathematics. This raises the issue of whether the risk is specifically for reading difficulties or more generally for a broad range of scholastic problems. In this study it was notable that the scholastic difficulties were as evident in mathematics as in reading and spelling. Crookes and Green (1963) also found evidence of arithmetical difficulties in language-impaired children but they tended to be less severe and less persistent than those in reading and spelling.

Another issue concerns the specific types of speech or language deficits that lead to the greatest scholastic risk. Crookes and Green found that reading abilities were similarly affected in language-impaired children and in those with pure articulation problems, although the language-impaired group showed the greatest arithmetical difficulties. Other studies have found that children with an isolated phonological disorder seem to have the best outcome, whereas reading problems are most frequent in children with global language impairment (Debray-Ritzen et al, 1976; Hall and Tomblin, 1978). Language impairment appears to persist longer in this group. Thus, in a 7-year follow-up, Beitchman et al. (1994) found that children with global language impariment at age 5 were more likely to show

continuing impairment at age 12, than were children who had experienced expressive impairments alone.

De Ajuriaguerra et al. (1976) noted that academic delay was present, and also found the problems seemed to increase significantly as the children grew older. They followed children for 2 to 4 years, with the oldest child reaching 12 years of age, and found widespread deficits in intellectual and academic development, persisting throughout the period observed.

Looking beyond education to prospects for employment there is very little information on whether children with a language disorder experience later problems in securing and holding down a job. In a useful study, Haynes and Naidoo (1991) contacted 34 ex-pupils of Dawn House school, an English residential school for children with speech and language disorders. These individuals were all 18 years or over and the information was collected mostly by telephone interview with either the ex-pupil or a parent. All but 3 had residual problems with written or spoken language. These included difficulties in: filling in forms; following the plot of films; using the telephone, and pronouncing long words. Notwithstanding these problems the majority of the group were either employed or in full-time education, and all but 3 had a history of stable employment. This study suggested that the prospects for employment may be quite reasonable, especially as it was carried out at a time when the country was experiencing high levels of unemployment. More information from other sources would, however, be very useful.

Socio-Emotional And Behavioural Disorders

It has already been seen from the cross-sectional studies cited in Chapter One that there are significantly higher rates of socio-emotional and behavioural problems in children who have developmental disorders of speech and language. There are few adequate follow-up studies in this field but those available suggest that psychopathological problems tend to increase

rather than diminish as children grow older. Baker and Cantwell (1987b) in their 5-year follow-up of a clinic-based sample found that the proportion with psychiatric disorder rose from 44% to 60%. Whilst a quarter of the sample were without identifiable disorder at the time of initial appraisal and developed disorder subsequently, only 8% of the sample had a disorder when young which resolved during the follow-up period.

Paul and Cohen (1984) reported some important findings of serious social abnormalities. They followed-up 28 language-disordered children into adolescence and found that at least half the group could not easily be distinguished from adolescents diagnosed in childhood as having infantile autism. This was because they showed the oddities of communication, failure of communicative intent, language deficits and social withdrawal that are characteristic of residual autism in adolescence. There were also sex differences, with the autistic-like group containing only 21% girls and the non-autistic group 43%. As with so much of the language research the groups were very heterogeneous. Nonetheless, this research makes a valuable contribution, especially when considered alongside the apparent social deterioration of the language-disordered subjects in the follow-up research described above.

In another description of the same group (Paul et al., 1983) it was reported that the children who were most likely to show the autistic-type social deficits were those with lower IQ scores. Furthermore, several other studies have found that psychopathological problems are more frequent if language delay is accompanied by lower than average intelligence (Baker and Cantwell, 1987b; Beitchman 1989; Silva et al., 1984). In a similar vein Fundudis et al. (1979) reported that disturbance was greater when speech delay was associated with motor delay (implying a greater likelihood of intellectual or general developmental impairment). Nonetheless there are several studies that have shown emotional and social problems to be common even in children with speech/language impairment whose IQ is in the normal range (Baker and Cantwell, 1982, 1987a and b; Griffiths, 1969).

The findings on whether the type of speech/language deficit affects psychosocial outcome are contradictory but it seems that the psychopathological risk tends to be greater when there is a deficit in language, especially if it involves comprehension, rather than just an articulation problem (Baker and Cantwell, 1987b). If children with a pure phonological problem are at any increased risk they appear to be more likely to experience emotional problems rather than attention deficit disorders (Cantwell and Baker, 1977).

Psychiatric Diagnoses

In addition to the educational and behavioural risks described, there are indications that at least some developmental language disorders may be associated with an increased risk of schizophreniform disorder. There are undoubtedly cases of children with developmental disorders of language who show schizophrenic-like psychoses in early adulthood (Howlin and Rutter, 1987), although difficulties arise in classifying both the developmental problems in childhood and the psychosis. Furthermore, it is well recognised that some cases of schizophrenia are preceded by developmental problems. Not all these problems are in the domain of language functioning (Rutter and Garmezy, 1983), but there are reports of delayed language acquisition (DeLisi, Boccio, Riordan et al., 1991; Kolvin, Ounsted , Humphrey et al., 1971) and reading difficulties (Done, Crow, Johnstone et al., 1992) being associated with schizophrenic-like psychoses in early adulthood. These cases are also usually accompanied by substantial social difficulties (Hanson, Gottesman and Heston, 1976). Van der Gaag (1993) reported the findings of a Dutch follow-up of young adults diagnosed as having 'multiplex development disorder' in childhood. This group represented an atypical group of developmental disorders in that they were not classically autistic nor did they have straightforward developmental language disorders. They appear to have been somewhat similar to the 'mixed' group described by Bartak et al. (1975)[1] Eight males and 4 females were followed-up into adulthood (age range 21 -33 years) and 2 were found to have

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[1]See p. 40 of this thesis.

developed schizophrenia in early adulthood.

There is important work to be done in identifying diagnostic sub-groups amongst language-disordered children and some initially promising work was done in this area by Lewis and Mezey (1985). They presented 6 case reports of individuals, all males, who were found on CAT-scanning to have a cavum septum pellucidum (CSP). It had been widely believed that a CSP had little, if any, clinical significance, but these subjects were found to have an unusual combination of developmental abnormalities including language delay in early childhood and the emergence of a paranoid psychosis in late adolescence or early adulthood. The cavum is present in the foetus and its persistence into adult life represents an arrest of normal maturation. This suggested that a congenital cerebral pathology may be responsible for this combination of psychosis and developmental delays. Nonetheless, although this research provided a puzzling but promising lead and caused a great deal of interest, it has yet to be replicated. Indeed a recent study using magnetic resonance imaging (Jurjus et al., 1993), found no difference in the frequency of CSP between subjects with either schizophrenia or affective disorder, and healthy controls. It should be said, however, that the subjects in this study had no known history of developmental delays and therefore may well have constituted a different type of sample from those in the research by Lewis and Mezey.

GENETIC INFLUENCES

The fourth major research area that needs to be addressed in investigating possible links between autism and developmental language disorders is that of genetic influences.

Taking autism first, research carried out in recent years has suggested that there is a genetic component to the syndrome so that whilst the rate in the general population is 2-4/10,000 (Lotter, 1966) the frequency of autism in the siblings of autistic individuals has been reported

as being 2-3%, a rate that is 50 times that found in the general population (August, Stewart and Tsai, 1981; Minton et al., 1982; Piven et al., 1990; Rutter, 1967; Rutter et al., 1993).

Although a family history of autism itself is uncommon, in part because of the extremely low likelihood of autistic individuals marrying and having their own children (Rutter, 1970), a family history of reading or language disability is relatively common within the families of autistic individuals, and it seems that some cases of language abnormality may be genetically linked with autism. One of the earliest reports to highlight this issue was that of Bartak et al. (1975) where in 5 out of the 19 families of autistic probands studied, at least one first-degree relative had a history of reading or language disability.

The growth of interest in genetic influences led to a number of family genetic studies. In one of the earlier studies, August et al. (1981) compared individual components of cognitive functioning between 71 siblings of children with autism and 38 siblings of individuals with Down's syndrome. They found that 15.5% (n=11) of the siblings of the autism group had some cognitive disability, including severe language disorders and pragmatic deficits. In contrast, less than 3% (n=1) of the Down's syndrome siblings showed cognitive disabilities. Baird and August (1985) have since replicated these findings with a different sample. Another indication that autism and language disabilities may have genetic links came from work by Minton et al. (1982). Their findings suggested a tendency for the siblings of autistic individuals to have lower IQ's than expected on the basis of demographic variables. In particular they found that the siblings showed a significant discrepancy between verbal and performance IQ's with verbal skills being the poorer of the two. The interpretation of their findings is, however, limited by the lack of a comparison group, nor have they been replicated, as yet. Another aspect of linguistic functioning that has been examined is social use. Landa and her colleagues studied the parents of individuals with autism and found that they showed raised rates of atypical pragmatic behaviours, such as skeletal or rambling narratives and failure to simplify according to the context (Landa et al., 1991; Landa et al.,

1992).

Evidence from a variety of studies suggest that other conditions, apart from language disorders, may be genetically associated with autism. Cantwell, Baker and Rutter (1978) reviewed the findings on whether there were increased rates of psychiatric disorder in the families of autistic probands, but did not find any evidence of any. Piven et al. (1990) on the other hand, did find an increased risk of certain social and emotional difficulties when they assessed 67 adult siblings of 37 autistic individuals, some of whom had been originally assessed by Kanner. 15% showed a treated emotional disorder (depression or mania), 15% a cognitive disorder[2] and 4.4% severe social dysfunction and isolation (SSDI)[3]. One of the limitations of this study was that there were no control groups with which to compare the results. However, it seems likely that the reported incidence of SSDI, in particular may have been an underestimate. The social interaction of those siblings with SSDI was said to be qualitatively similar to those of autistic individuals and although several other siblings showed evidence of abnormal social interaction and isolation as adults, the quality of the information obtained using the family history method was not sufficient to include them in this category. Further the authors reported that the rate of treated affective disorders was unexpected, and significantly higher than the rate expected in the general population (based on data from the Epidemiological Catchment Area Study; Robins et al., 1984). Evidence concerning parents comes from studies by Wolff and her colleagues (Narayan, Moyes and Wolff, 1990; Wolff, Narayan and Moyes, 1988). They found that the parents of individuals with autism had a raised incidence of characteristics such as social gaucheness and a tendency towards the single-minded pursuit of special, often intellectual, interests.

More recently there has been a report of similar findings from a detailed, systematic study

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[2]7 had a history of reading and spelling disorders, and of these 2 also had articulation disorders; 2 had autism, and 1 had experienced delayed language.

[3]This was defined as an absence of friendships and other intimate relationships; disinterest in social interaction leading to social isolation; an inability to sustain regular employment at a level appropriate to educational level, and a constricted range of non-verbal expressions of emotion that is readily noticeable by others.

that had the advantage of a control group (Bolton et al., 1994). Detailed pedigrees were obtained from the first-degree relatives of 99 individuals with autism and 36 with Down's syndrome. The study focused on three main domains: (a) cognitive abnormalities such as severe language delay[4], or severe reading and spelling difficulties; (b) social abnormalities in terms of features such as impaired social reciprocity and lack of friends, and (c) repetitive, stereotyped behaviours such as circumscribed interests. As well as collecting this information, factor analysis was undertaken to determine how the selected characteristics grouped together. The findings were that the siblings of the autism group had substantially higher rates of language/communication difficulties, social deficits, and to a lesser extent stereotyped behaviours. The difference between the groups was most evident when there was a combination of at least two out of these three domains of abnormality, although there was also some increase when such abnormalities occurred in isolation. 3% of these siblings had clear-cut autism, another 3% showed an atypical syndrome of autism, and a further 3% had a combination of cognitive and social abnormalities that were qualitatively similar to those seen in autism but fell outside the diagnostic boundaries for the syndrome. Hence 9% of the siblings showed either autism or some autistic features, and once siblings with isolated cognitive and social abnormalities were included then the rate of disorder in siblings rose to 20%. This study also suggested that there may be genetic heterogeneity in autism. There was a different pattern of familial loading in probands with and without speech, suggesting that they may constitute different groups.

These family studies have highlighted the increased rate of cognitive and language deficits in siblings and other family members. Twin studies have also provided valuable data. In the first British twin-study of autism, Folstein and Rutter (1977) systematically studied 21 same-sex twin pairs in which at least one twin had the syndrome of infantile autism. There were 10 dizygotic (DZ) twin pairs of whom none was concordant for autism; and 11 monozygotic pairs (MZ) of whom 4 were concordant. In addition to the 25 children with autism there were 6 who showed some form of cognitive impairment. Three of these had been markedly delayed in

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[4]Defined as the child having no single words until 24 months of age and/or no phrase speech until 33 months of age.

early speech development, a fourth child had severe articulation abnormalities until the age of 7 years, a fifth was generally retarded in development, and the sixth had not suffered any speech delay but had a verbal IQ 21 points below the non-verbal and was mildly retarded in development. Five of the 6 children with cognitive impairment were from MZ pairs. This meant that 5 of the 7 (82%) non-autistic children in MZ pairs had cognitive abnormaliites compared with 1 (10%) of the 10 non-autistic children in DZ pairs. Folstein and Rutter concluded that there are important genetic influences on a fundamental cognitive disorder that includes, but is not restricted to, autism. Such a cognitive disorder may present in its mildest form as a learning disability and in its most severe form as autism.

The British twin sample was re-examined after 10 years, and a second population recruited (Bailey et al., 1995). Of the 25 MZ pairs studied, 76% of the non-autistic co-twins were found to have social difficulties together with a cognitive disorder. These social difficulties were similar to those seen in autism but were of a lesser degree and they sometimes became more obvious with development. In contrast, none of the 20 DZ pairs showed this combination of social and cognitive disorders. The authors suggested that the genetic liability is for the development of a combination of specific cognitive and social abnormalities, with autism as the most severe phenotype. Another question addressed by this study is what role obstetric hazards play in the aetiology of autism. There have been suggestions that they play a significant role (Folstein and Rutter, 1977; Steffenburg et al., 1989), but evidence from this study suggests that they tend to be *consequences* of genetically determined abnormal foetal development rather than *aetiological factors.* Examples of these were congenital anomalies, or the types of weight differences that suggest abnormalities have occurred early in development.

Although by far the majority of studies have found positive evidence for the familial aggregation of language, cognitive and social deficits in autism, two have had essentially negative findings. Gillberg, Gillberg and Steffenburg (1992) found few differences between a group with autism and a normal control group. There were only 35 children in the autism

group, however, and they tended more often to be the first and only child in the family (32% were only children as compared with 2% amongst the controls) leading the authors to suggest that there may have been genetic stoppage in this group. The other negative findings came from a study by Szatmari et al. (1993). This compared the unaffected siblings and parents of 52 probands with pervasive developmental disorder and 33 Down's syndrome and low birth weight controls. It is not clear why their finding that there were no significant differences between the groups should be so different from the other studies, but it has been noted that the probands were more clinically heterogeneous than in other studies (Bailey et al., in press).

If the focus of attention is turned towards language disorders there is also found to be evidence for familial aggregation. Various studies have indicated that amongst children with developmental language disorders there is a surprisingly high incidence of family members who also have some history of speech and language disorders. Robinson (1987) found that 40% of the language-impaired children he studied had some family history of speech delay and 28% had such a history in a parent or sibling. Other studies have also reported an abnormally high concentration of affected individuals in families of children with a language disorder (Bartak et al., 1975; Beitchman, Hood and Inglis, 1992; Bishop and Edmundson, 1987b; Haynes and Naidoo, 1991; Neils and Aram, 1986; Paul et al., 1983; Tallal, Ross and Curtiss, 1989; Tomblin, 1989). Lewis (1992) carried out a large-scale pedigree study of individuals with preschool phonological disorders and found a wide range of speech, language and literacy problems amongst the relatives, suggesting that there is a broad deficit in verbal functioning that is transmitted genetically. In the first large-scale twin study of the genetics of developmental language disorder, Bishop, North and Donlan (1995) report data from a sample of 63 MZ and 27 DZ same-sex twin pairs, each of which contained at least 1 twin who met strictly defined criteria for developmental speech or language disorder. When variables such as a past history of a language-related disorder or a discrepancy between verbal and non-verbal ability were included, concordance for MZ twins was close to 100 per cent and that for DZ twins was approximately 50 per cent. The reported rate of speech,

language and learning disorder amongst first-order relatives was comparable to other studies at 27 per cent. The authors concluded from these findings that there is good evidence that genetic factors play a role in the aetiology of speech and language impairment.

Whitehurst, Arnold et al., (1991), on the other hand, studied the families of 2- and 3-year old children with specific expressive delays and did not find any evidence of a raised family history of language problems. In another study (Whitehurst, Fischel et al., 1991) they had found that this group made a good spontaneous recovery. It is possible that familial aggregation may differ depending on the type of language disorder, with problems that are more slow to resolve forming part of the phenotype of heritable disorder (Bishop et al., 1995).

SUMMARY

The purpose of this chapter was to present findings from a range of research domains, all of which raise fundamental questions about the nature of the relationship, if any, between autism and the more serious varieties of developmental language disorder. Taken individually these findings are interesting. Presented together, however, they form a powerful argument in favour of further research, and the next chapter summarises the issues that need to be addressed.

CHAPTER THREE: RESEARCH ISSUES ON THE NATURE OF AUTISM AND DEVELOPMENTAL LANGUAGE DISORDERS

The previous two chapters have highlighted fundamental questions about the nature of autism, and in particular about the relationship between autism and certain types of developmental language disorders. In this chapter many of these issues are summarised and consideration is given to the ways in which they may best be investigated.

Five major issues are detailed below. The first concerns the specificity of the deficit in autism. The second highlights the relationship between autism and developmental language disorders. The remaining three issues focus on the developmental language disorders. It is important to address these issues for two reasons. Firstly, the state of knowledge relating to the language disorders themselves needs to be advanced, and secondly, it is only by further clarification of their characteristics and the identification of possible diagnostic sub-groups that any meaningful data can be used in comparisons with autism.

1. IS AUTISM AS NARROW AND SPECIFIC A DEFICIT AS SOME HAVE CLAIMED ?

As indicated in Chapter 1, there remains considerable controversy as to the pervasiveness, or otherwise, of the deficits associated with autism. The only way of resolving this debate is to examine the functioning of individuals with autism, across a broad range of arenas, and over time. To date there have been relatively few long-term follow-up studies that have done this. A study that did would not only add valuable data to the body of knowledge on outcome; it would also address the issue of how pervasive the disorder is in adulthood.

2. WHAT IS THE ASSOCIATION BETWEEN DEVELOPMENTAL LANGUAGE DISORDER AND SOCIO-BEHAVIOURAL/EDUCATIONAL PROBLEMS?

The question of what mechanism underlies the association between developmental language disorder and psychopathological risks was discussed in Chapter One, where it was made clear that different mechanisms may apply in different circumstances. The findings from the follow-up studies described in Chapter Two, however, highlighted the need to retain a developmental perspective in searching for explanatory mechanisms. For example, in addressing the question of why there should be an apparent 'deterioration' in social relationships it is important to bear in mind that the demands of social situations increase as children grow older (Hartup, 1983). This may to some extent explain the apparent 'worsening' in social functioning. A mild language disorder at 10 years could be more damaging to peer relationships than a severe disorder at 6 years, simply because older children are better able to detect the abnormality and are more likely to reject the child who is viewed as different (Bishop, 1994). Griffiths (1969) found that language-disordered children who had gone on to ordinary schools were experiencing more emotional and behavioural problems than those in special schools and this suggests that children may indeed be better adjusted in environments where they do not stand out as different. With regard to educational risks, it has been suggested that there may be sensitive periods in the child's cognitive development and if he misses out on crucial learning experiences during these, because of his language impairment, then he may never quite 'catch up' despite acquiring fluent spoken language (Rutter, 1987b).

These explanations emphasise the fundamental role of the linguistic impairment in language disorder, with the associated socio-emotional and educational sequelae arising as secondary consequences. However, it is not clear whether developmental language disorders <u>are</u> always disorders of language alone. Might the highly persistent social deficits that are seen in some severe disorders of receptive language, themselves constitute a basic part of the communication disorder?

What are needed to address this issue are data on adults who were diagnosed in childhood as having a severe disorder of receptive language. Their current language and social functioning need to be described in detail so that the different hypotheses about the relationship between these two domains can be tested for plausibility. It has already been seen in Chapter One that linguistic functioning can be described in terms of a variety of subsystems (i.e. phonology, syntax, semantics and pragmatics) and that social functioning can also be sub-divided to cover topics such as peer relationships, occupational adequacy and socio-emotional understanding. It is crucially important to have data on a range of aspects of social functioning since different deficits carry different implications about the relationship between the domains. It is fairly easy to argue, for example, that a lack of peer relationships is a secondary consequence of linguistic difficulties through routes such as social rejection or a lack of confidence in social situations. Whilst it could equally be argued that the social difficulties are manifestations of a basic social deficit it is difficult to prove the nature of the relationship for certain, and the inherent plausibility of the secondary route continues to make it an acceptable hypothesis. A rather different situation emerges, however, with a deficit such as 'lack of empathy' or 'difficulty in interpreting the emotions of others'. It is possible that an impoverishment in early social relationships, arising from impaired language, could affect the development of these deficits, but on the whole it is harder to present them as secondary consequences of language impairment. Therefore, if problems of this type are found it is possible to put forward an argument in favour of the social deficit existing as a basic part of the disorder.

Again, a longitudinal study is required, since in order to tease out further the relationships between the two domains, it is necessary to examine the patterns of change in the different areas of functioning, over time. It is unlikely that all cases within a study would show the same pattern and the difficulties in finding a homogeneous group have already been discussed. Bishop (1992) suggested that this should not discourage researchers from using groups of language-disordered children, but it should influence the way the data are

analysed. It is not adequate to compare group means and assume that the mean is representative of the group. The extent of the variability in the group also needs to be examined and attempts made, where appropriate, to relate this to explanatory factors such as age, personality, intelligence or education.

3. HOW CAN OUTCOME BE PREDICTED IN DEVELOPMENTAL LANGUAGE DISORDER?

It seems likely that there are two broad classes of language delay. Some instances probably represent no more than normal variations in development, or in extreme cases what might be termed a 'maturational lag'. Children vary in the age at which other events occur, such as teeth erupting and reaching puberty, and so it is not surprising that there are variations in when they first speak. Differences of maturational timing are likely to have important psychosocial consequences (Rutter and Mawhood, 1991), but these cannot be seen as biological risks stemming from an underlying neurodevelopmental disorder. At the other extreme are cases of marked language delay where there is an underlying pathology. In some cases this may be due to a known condition such as a chromosomal abnormality but in other instances it will be inferred rather than proven.

It has proved somewhat difficult to differentiate these two categories at an individual level. Bishop and Edmundson (1987, a and b) provided the best data in this respect. They undertook a prospective longitudinal study of 87 4-year old children with a clinically significant language delay. Nineteen of the 87 children had a non-verbal score on the Leiter more than two standard deviations below the mean; they were termed a 'general delay' group with the remainder termed 'specific delay'. When the children were followed-up at five and a half years, 44% (30 out of 68) of the 'specific delay' group and 11% (2 out of 19) of the 'general delay' group were identified as having a 'good outcome' as they no longer met the

criteria for severe language delay. Although their mean scores were slightly lower, they were closely similar to cross-sectional controls, in terms of language functioning. Further follow-up at 8 years of age showed that this separation of groups had continued. Those with a 'good outcome' at 5 1/2 years had language skills only slightly below those of controls, whilst the 'poor outcome' group continued to show very substantial language impairment. The children in the 'good outcome' group appeared to be functioning normally in terms of scholastic progress, but reading comprehension and spelling difficulties were evident in the 'poor outcome' group. This suggested that educational progress is normal in most instances where children have 'caught up' in their language development by the time they start school.

The highest proportion of 'good outcomes' (78%) was for children with a pure phonological impairment and the lowest (0%) for children with a global language impairment associated with a non-verbal IQ below 70. Within the middle range, prognosis was best for children with a narrow range of language functions impaired, and with a milder degree of impairment. A persistent language deficit can thus be predicted to some extent by both the severity and the breadth of the language deficit at 4 years of age. Nonetheless, on an individual level it is still difficult to predict which children will make good progress and which will show persisting problems. Here, too, then there is a need for long-term prospective research with language-disordered individuals, this time in order to clarify the specific factors that are likely to be associated with a good, or a poor, prognosis. There is also the finding by Bishop and her colleagues (1995), already raised on p.74, that problems that are more slow to resolve might prove to have genetic origins.

4. WHAT IS THE RELATIONSHIP BETWEEN AUTISM AND DEVELOPMENTAL LANGUAGE DISORDERS?

The review of research over the past 20 years covered in Chapter Two raised new questions

about the nature of the relationship between autism and the more severe developmental disorders of receptive language.

Firstly, new advances in the classification of language disorders have highlighted what appear to be areas of overlap between the two disorders.

Secondly, reports from twin and family studies suggested that autism may be genetically associated with at least some varieties of language disorder. Strong evidence now exists for a genetic liability in which the most severe phenotype manifests as autism and other phenotypes include a range of specific cognitive and social abnormalities, including certain types of language impairments.

Finally, data from a variety of follow-up studies have revealed that psychopathological problems in language-disordered individuals, especially those with the more severe receptive disorders, may become more overt with age, rather than diminish, and can persist long after fluent spoken language has been acquired. The follow-up comparison of autism and developmental receptive language disorder by Cantwell et al. (1989) revealed that although the groups differed in many respects, there were ways in which the overlap was greater in middle childhood than it had been when they were first studied (Bartak et al., 1975). In particular, the language-disordered group showed increasing difficulties in peer relationships as they grew older.

Although there were some suggestions of increasing similarities between the two groups as they grew older, at the time of the present study there were no systematic data on their relative levels of functioning in adulthood. Taken together, the research findings summarised above suggest that data on linguistic, social, behavioural and cognitive aspects of functioning are clearly needed. Information on reading comprehension and spelling is also necessary in order to clarify better the patterns of cognitive deficits in the two disorders.

5. WHAT IS THE PSYCHIATRIC RISK IN DEVELOPMENTAL LANGUAGE DISORDER?

It has been seen that some forms of language delay carry an increased risk for schizophrenia developing in late adolescence or early adult life. It is unclear whether this risk stems from the language disorder *per se*. Paul et al. (1983) have suggested that language-impaired youngsters may develop depression, loose associations and thought disorders because of an inability to mediate cognitive structures with language. Alternatively the risk may stem from an underlying neurodevelopmental or genetic abnormality that just happens to involve language problems (Rutter and Mawhood, 1991), with some possible risk added by prenatal/perinatal factors (Murray et al., 1989). There are very few data available to address these issues and further research looking at psychiatric risk in developmental language disorder would clearly be valuable.

As far as autism is concerned there does not appear to be a particular risk for schizophrenic-type disorders. A large scale follow-up into adult life by S. Goode, M. Rutter & P. Howlin (unpublished data) of over a hundred children with autism has revealed no instances of schizophrenic-type disorders. Volkmar and Cohen (1991b) had similar findings when they examined the case records of 163 individuals with a diagnosis of autism, ranging in age from 15-41 years; only one subject had a history of schizophrenia. On the other hand there are occasional reports in the literature of schizophrenia arising in individuals thought to show autism (Howells and Guirguis, 1984; Petty et al., 1984; Watkins, Asarnow and Tanguay, 1988), but it appears that this outcome is found only in individuals with *atypical* autistic syndromes and not in those with the characteristic autistic pattern as usually diagnosed (Rutter and Mawhood, 1991).

THE STRENGTHS OF PROSPECTIVE RESEARCH

In exploring the best way to address these issues, long-term follow-up studies have been mentioned a number of times. These types of prospective studies have a particular role to play in resolving many key issues (Rutter and Mawhood, 1991). They offer a variety of advantages over retrospective designs and these can be summarised as follows:

Firstly, they are crucial for investigating time relationships and are the only sure way of collecting reliable data, since parents, for example, can be quite good at remembering *whether* major problems such as behavioural disturbance were experienced but are much less good at remembering accurately *when* these happened.

Secondly, they provide the best opportunity to collect standardised data on the aspects of functioning under investigation. It is unlikely, for example, that clinic records would routinely provide adequate data on the relative extent to which syntactic or pragmatic difficulties occur. Collecting detailed, reliable and standardised data on early aspects of functioning is vital in elucidating prognostic factors.

Thirdly, there may be mediating variables, such as temperamental difficulty, auditory processing defictis or metacognitive deficits, that are unlikely to have been assessed routinely in the clinical situation, and cannot adequately be recalled because the individual will not have had adequate awareness of the problem.

Fourthly, only prospective studies are likely to detect unexpected outcomes or sequelae. If the initial language problems had resolved at follow-up but some other disorder had developed, the continuity of data would allow a potential relationship between the two to be examined. A retrospective study, on the other hand, may fail to take into account that there had been earlier language problems and the potential for relating the two disorders would be missed. This point is pertinent with regard to the relationship between the schizophreniform

illnesses discussed earlier in this chapter and a history of early language retardation.

Fifth, prospective studies can be used to collect data on the risks of particular sequelae, and also on the rate of escape from this risk. It is important to find out what proportion of older individuals with a psychosocial disorder experienced the early risk factors, in this case language delay. Equally, it is important to examine how many subjects with the early risk factor did not go on to develop these sequelae.

Finally, risk relationships should be investigated, where possible, over multiple time points, and this offers several advantages. At least three data points are needed in order to separate real change from regression to the mean effects (Rutter and Mawhood, 1991). Also much greater power is given to the testing of causal hypotheses when changes over time in one variable can be related to subsequent changes over time in some other variable. Farrington (1988) highlighted the need, if causal mechanisms are to be adequately tested, of investigating *within*-individual changes as well as *between*-individual differences.

In conclusion, it can clearly be seen that a long-term prospective study offers the best opportunity to investigate the questions highlighted in this chapter. There have been a number of such studies in the field of developmental language disorder, with rather fewer in autism. However, the review of follow-up studies of language disorders, provided by Rutter and Mawhood (1991) revealed the extent to which many of these studies failed to comply with important methodological criteria such as having data at 3 or more time points; taking into account or excluding associated handicaps; having a detailed initial assessment of language/speech disorder; and making a systematic standardised assessment of psychological abnormalities at follow-up. There is also a great shortage of follow-ups extending into adult life.

One study that fulfilled many of the necessary methodological requirements was the follow-up comparison of autism and language disorder, into middle childhood, carried out by

Cantwell and his colleagues. It was decided to undertake a further follow-up of these subjects, into adulthood, since this presented a good opportunity to address a number of issues related to both diagnostic categories. The chapters that follow describe the design of this study and the resulting findings.

CHAPTER FOUR: DESIGN OF THE STUDY

AIMS OF THE STUDY

The investigation set out to examine a group of young adult men, seen originally in early childhood by Bartak et al. (1975) and followed-up during middle childhood by Cantwell et al. (1989). Some were originally diagnosed as autistic and the others as having a developmental receptive language disorder.

The study set out to answer the following questions:-

1. Is autism as narrow and specific a deficit as some have claimed?

2. What is the association between developmental language disorder and socio-behavioural/educational problems?

3. How can outcome be predicted in developmental language disorder?

4. What is the relationship between autism and developmental language disorders?

5. What is the psychiatric risk in developmental language disorder?

THE INITIAL SAMPLE

The original sample consisted of a total of 47 subjects with a current and severe disorder of language comprehension that had been present from infancy and was not due to overt neurological disorder or peripheral deafness. The last item was defined operationally by excluding all children with a bilateral hearing loss exceeding 40dB. The children ranged in age from 4 years 6 months to 9 years 11 months and all had a non-verbal IQ of at least 70. Only boys were included because other research (Lotter, 1966; Rutter and Lockyer, 1967; Treffert, 1970) had indicated that the probability of finding autistic girls of normal intelligence was low, and studying only boys avoided the need to control for possible sex differences.

It was considered, in selecting the sample, that children falling within the terms of the definition would be unlikely to escape referral to some type of service agency. Vagaries of local referral practice, however, were considered likely to result in children attending quite varied institutions and therefore a wide range of clinical and educational facilities were approached in order to obtain a representative sample. Paediatric, neurological, audiological, speech and psychiatric clinics were included, as well as special schools taking either children with autism or uncomplicated language disorders. Major units within the UK were asked for details of cases that might meet the above criteria. On the basis of data available from case notes in each unit, parents of suitable cases were contacted for permission to include them in the study and the eventual sample was made up of children attending 4 hospital units and 6 special schools (see Appendix I. for details).

Within this group who had been selected because they had a severe developmental receptive language disorder, a subdivision was made using the available clinical and school records. Accordingly 19 children were classified as showing the syndrome of infantile autism using the criteria outlined by Rutter (1971), and are referred to hereafter as the 'autism' group. In order to be classified as autistic there had to be a profound and general failure to develop social relationships; one or more ritualistic or compulsive phenomena, and an onset

occurring by the age of 30 months. Failure in social development was revealed by the presence of features such as aloofness and apparent lack of interest in other people, avoidance of eye-to-eye gaze and little variation in facial expression. The ritualistic and compulsive phenomena included morbid attachment to unusual objects, resistance to changes of any kind, peculiar preoccupations and a variety of quasi-obsessive rituals. There were 23 children without clearly autistic features, and these were diagnosed as having an uncomplicated developmental language disorder that included impairment in both comprehension and expression. They are referred to hereafter as the 'developmental language disorder' (DLD) group. In addition there were 5 children who showed some autistic features but whose disorder was regarded as partial or atypical in its manifestations. They are referred to as the 'mixed' group.

TRACING THE SUBJECTS

It was necessary for the current research to find as many of the original 47 subjects as possible. Some were found to be still living at the address where they had been seen originally, or had parents who were still living there. The National Health Service Central Register in Stockport was able to help in finding other subjects who had moved, by providing details of the District Health Authority (DHA) in which the subject was now resident. The relevant DHA's were then contacted, and in most cases supplied either the address of the subject, or the name and address of his general practitioner who then became the first point of contact with the family. A few subjects proved more difficult to trace and in these cases it was necessary to follow whatever leads were available. These included: making contact with schools they were known to have attended; checking whether they or their families were known to either the National Autistic Society or to AFASIC; checking electoral registers, and writing to medical personnel who were known to have treated them in the past. Eventually it was possible to trace and make contact with all 47 of the original subjects. Several subjects

were discovered to have moved outside the UK. Two had emigrated with their families and a third subject had moved to Europe with his mother when she remarried.

The subjects and their parents were contacted by means of a letter explaining in very general terms that they had taken part in some research as children, and as a follow-up to this we wished to talk to them and find out about their experiences in adolescence and young adulthood. An appointment was then made to visit the subject and his parent(s), either together or separately depending on their living arrangements.

TERMINOLOGY

Although the language disordered group had been referred to as 'dysphasic' in the previous two studies it was decided to rename them the 'DLD group', standing for 'Developmental Language Disorder'. This is now felt to be a more suitable term in Britain and North America; 'dysphasic' being more appropriately used when referring to cases in which there is independent evidence of a neurological basis for the condition (Bishop, 1992). The term 'DLD' was used here in reporting the results of the first two studies as well as in the current research.

With regard to terminology for the three data-points at which data are available, the first time-point, that in early childhood, will be referred to throughout as Time 1. The second time-point covering middle childhood will be termed Time 2, although data at that point were somewhat limited, and the third, which is concerned with the current study of the subjects in young adulthood, will be referred to as Time 3.

EXCLUSIONS

Early on in the course of assessment at Time 3, all subjects were given a screening hearing test using a free-field warble-tone audiometer (Meg Instrumentation Ltd.). None of the subjects in the autism group showed any evidence of significant hearing loss, although it was not possible to test some members of this group since they did not understand the instructions that they should indicate when they heard the tone (n=9). Nonetheless, there was no reason to believe from discussion with close relatives that any of this 'difficult to test' group had any significant hearing impairment. It was found, however, that 3 members of the DLD group did have a significant hearing loss. Although the original study had specifically stated that children with a bilateral hearing loss exceeding 40dB were to be excluded, the fact that these children were not presenting clearly as deaf at that time underlines the difficulties involved in making a differential diagnosis. A number of authors have pointed out that even in ideal conditions, hearing deficits may not be easy to identify in certain types of children and that often a correct diagnosis may not be achieved as early as desirable (Coplan, 1987; Merklein and Briskey, 1962; Rosenberg, 1966). Although the complete assessment battery was given to these 3 individuals it was decided to exclude them from the main body of analyses since their hearing impairments may have resulted in them constituting a somewhat different group. A description of their functioning is given in Appendix II. It is of interest to note that at least 2 of these 3 young men appeared to be having quite severe problems with loneliness and a lack of relationships. They also had special interests that were both slightly unusual in nature and unusually strong. With the exclusion of these subjects the DLD group was reduced from 23 to 20.

The 'mixed group' was originally made up of 5 subjects who showed some autistic features but whose disorder was regarded as atypical or partial in its manifestations. At follow-up this group still appeared to be very heterogeneous, ranging from one member who had, after graduating from university, taught English in Japan, to another who was unable to talk at all,

and because of this they, too, were excluded from the main analyses. Individual vignettes outlining their current functioning and developmental details are given in Appendix III.

AGE OF THE SUBJECTS

The mean age of the 19 autistic subjects was 23 years 9 months (*range 21 years 3 months - 26 years 7 months; S.D.= 1.79 years*). For the 20 subjects remaining in the DLD group the mean age was 24 years 10 months (*range 21 years 10 months - 28 years 2 months; S.D.= 1.56 years*).

DATA COLLECTION METHODS

Large parts of the data were collected through direct assessment of, and interview with, the subject himself. In addition it was felt important to obtain information about relevant episodes and events over the period since the first follow-up and so for each subject a close relative was interviewed, preferably a parent, but where none was available, anyone else who knew the subject well and therefore could act as a valid informant. As well as providing data that subjects may not have been able to supply themselves, the informant interview was helpful in elucidating or verifying information provided by the subject.

In the autism group 5 sets of parents were interviewed together and 2 fathers and 12 mothers alone. The DLD interviews were made up of 4 sets of parents interviewed together and 14 mothers, 1 father and 1 sister interviewed individually.

PSYCHOMETRIC ASSESSMENTS

A variety of psychological tests was used with the subjects to assess verbal and non-verbal intelligence and levels of attainment for arithmetic, spelling, and aspects of reading ability as well as a number of assessments related to language functioning. The choice of tests was determined by several factors. Firstly, the two previous studies had provided a large amount of data on IQ, patterns of cognitive functioning and receptive vocabulary, and comparable tests were used here so that changes over time could be examined. Secondly, some of the tests used earlier, particularly reading tests, were not suitable for use with this adult age-group and so more appropriate ones needed to be found. In order to gain a comprehensive picture of reading skills it was felt that the best approach was to use a combination of different tests, one assessing oral reading ability and a second examining reading comprehension. Thirdly, some areas of functioning that were not investigated before, were of interest here, and this resulted in some further new tests being included in the assessment battery. Accordingly, assessments covering computational ability and spelling were included so that their results could contribute, with reading levels, to an overall picture of educational attainment. Moreover, this adult group required more detailed and wide-ranging linguistic assessments in order to pick up the more subtle deficits of their language. In view of this it was decided to use: a measure of expressive language; a test of auditory discrimination to determine whether oral comprehension difficulties may result from an inability to differentiate between phonemes, and finally a measure of the *overall* process of oral understanding.

A summary of these tests, and the numbers of subjects in each group who completed them, is given later in this chapter in Table 4.1.

Intelligence measures

The two earlier studies both used the Wechsler Intelligence Scale for Children (WISC) (Wechsler, 1949) as the main measure of intelligence and in this study the adult counterpart of this, the Wechsler Adult Intelligence Scale-Revised (WAIS-R) (Wechsler, 1981) was administered to all subjects.[1] In the administration manual of the WAIS-R, Wechsler stated that the WAIS-R and the WISC-R (Wechsler, 1974), which superseded the WISC, yield equivalent IQ's when normal 16-year olds are tested and that IQ's from the two tests are therefore comparable. Likewise in the manual for the WISC-R, Wechsler stated that the new form of the test was comparable with the old one and so this would seem to suggest that IQ results from the WAIS-R may be directly compared with the WISC. Despite these assertions, however, some researchers have expressed concern over the relationships between the various tests. Taking first the comparability of the WISC and WISC-R, Flynn (1985) reviewed 33 different studies in which subjects had both the WISC and WISC-R administered to them anc concluded that subjects appeared to score higher on the WISC than on the WISC-R. These differences held at virtually every level of the IQ scale, being greatest (*average of 9.5 points*) for subjects with a WISC IQ below 70; least for those with an IQ above 115 (*average 7 points*), and an average of 8.5 points for those with IQ's between 70 and 115. There does not seem to be any research that systematically compares scores for the WISC and WAIS-R but there is quite a body of results comparing the revised forms of both tests. Spitz (1988) compared scores on the WISC-R and WAIS-R of students living in a relatively short-term institution and subdivided into two groups according to whether their WISC-R IQ was below 54 or above 53. He found that in the lower IQ group (*mean WISC-R IQ 44.8*) there was a difference of 17.3 IQ points between their mean IQ on the WISC-R and on the WAIS-R (*62.1*). For the higher IQ group the difference was only 6.2 points (*mean WISC-R IQ = 62.5; mean WAIS-R IQ = 68.7*). Other researchers have confirmed the finding

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[1] At the time of data collection (1986-9) the British version of the Scales (Wechsler, 1992) was not available.

that there is a disparity between WAIS-R and WISC-R scores with scores being higher on the adult version (Avery, Slate and Chovan, 1989; Rubin, Goldman and Rosenfeld, 1985; Sattler et al., 1984; Vance et al., 1987) and with the greatest disparity occurring in the lower IQ ranges (Zimmerman, Covin and Woo-Sam, 1986). On the other hand, Quereshi, Treis and Riebe, (1989), in looking at a normal population found that scores were higher on the WISC-R than the WAIS-R. Slate, Frost and Cross (1990) made similar findings with a group of learning-disabled students. The findings in this study were in contrast with those from earlier research that the first author had been involved with (see above). To add to the confusion Quereshi et al. (1989) found there was less difference in the verbal scale between the two versions than in the performance scale, whilst Avery et al. (1989) found the difference to be *greatest* on the verbal scale. These somewhat contradictory findings show that there is no consensus between studies regarding the results from different versions of the Wechsler. In general these tests are widely used and well regarded, but the issue of comparability between the WISC and the WAIS-R will need to be returned to in interpreting the results from the current study.

In the first study additional information on patterns of non-verbal abilities had been gathered by administering the Coloured Progressive Matrices (CPM) (Raven, 1965). This is intended for use with children aged 5-11 years, or low-functioning subjects beyond these ages, and so was not suitable for general use in the present study. Instead the Standard Progressive Matrices (SPM) (Raven, 1956) were used. This scale is intended to cover the whole range of intellectual development from 6 years upwards. At Time 1 a ratio 'IQ' was used (calculated by dividing mental age by chronological age), but at Time 3 it was not felt suitable to use this formula[2] and so deviation IQ's were used, calculated according to data provided by Lord (personal communication - see Appendix IV). These different methods of calculating the 'IQ'[3], and the fact that different forms of the test were used at Times 1 and 3, mean that the

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[2]Since the relationship between MA and CA is not linear.

[3]Raven (1990) warns that the term 'IQ' should be used with caution in connection with the Raven's Matrices since the scores are not interchangeable with 'Intelligence' tests which sample a wider range of abilities, nor do the Matrices have a Gaussian distribution.

results at the two time-points cannot sensibly be compared. The main reason for using the Raven's Matrices at Time 3 in addition to the WAIS-R, however, is that they are able to provide an index of intellectual capacity which is relatively free of linguistic constraints and from educational influence.

A number of studies have looked at the relationships between the two measures of intelligence. Some American studies with adults have found very high correlations between the Standard Progressive Matrices and the WAIS (Bingham, Burke and Murray, 1966, *r=0.85*; Burke and Bingham, 1969, *r=0.75*; Sheppard et al., 1968, *r=0.88*). Sydiaha (1967), however, found only a correlation of 0.53 between the Progressive Matrices and the WAIS and concluded that the former should be used as a test in its own right and not as an estimate of WAIS full-scale IQ. This research serves to highlight the importance of investigating patterns of cognitive functioning by looking at results from more than one test.

Language tests

Language functioning in the previous studies was assessed primarily using two different tests. The first of these, the Reynell Developmental Language Scales cover both expression and comprehension (Reynell, 1969). The ceiling for these scales is, however, 6 years and so they were not appropriate for use here, and other more suitable tests had to be found. The second of these tests was the Peabody Picture Vocabulary Test (PPVT) (Dunn, 1959). This measures receptive vocabulary and provided a further estimate of verbal abilities, in addition to the verbal scales of the WISC. Since then a British version, the British Picture Vocabulary Scales (BPVS) (Dunn et al., 1982) has become available and the 'long' version of this (156 items) was used here, both because it seemed more appropriate to use a test that had been standardised on a British population, and also because of a need to be compatible with other research in the Department. Unfortunately, the range of ability over which the calibration and standardisation of the BPVS was undertaken did not extend far into

areas of very low ability, was based on a selected sample after age 16 and did not extend beyond age 18. There were thus a number of subjects from this study for whom standardised scores were not available directly from the Manual's tables. Although, for a number of these subjects, a standardised score could be reliably obtained by minor extrapolation of those published tables, there remained a number of subjects who were either too old or with raw scores too low for this to be done using the British tables. By contrast, the similarly constructed American PPVT test provided standardisation tables on an unselected sample for chronological ages into adulthood. Moreover, both British and American tests provided raw score to age equivalence tables that covered the whole range of abilities of subjects in this study. A two-step procedure was thus followed to obtain standardised scores. Firstly BPVS raw scores were translated into PPVT 'raw scores'[4]. In the second step, standardised scores were obtained for most subjects directly from the PPVT standardisation tables. For some subjects, however, the published standardisation tables did not extend sufficiently far into the low ability range. The PPVT standardisation tables were therefore extended downwards. The procedure and the tables so produced are given in Appendix V, parts a and b.

As well as assessing receptive vocabulary it was considered important to look at some of the other language processes that are involved in the understanding of speech. One essential aspect of language comprehension is the ability to differentiate the phonemes which make up an utterance, and to investigate this the Auditory Discrimination Test (Wepman, 1958) was given. The test is designed to assess the ability of an individual to hear differences between phonemes used in English speech and takes about 5 minutes to administer. The subject listens to 40 pairs of words that are either identical (zone, zone) or differ in only a single phoneme (thief, sheaf) and is required to indicate whether the words are exactly alike or different. The total number of incorrect discriminations are then totalled and the subject categorised as having adequate or inadequate development of auditory

[4]Using the formula "PPVT 'raw score' = 175/150 x BPVS raw score", there being 175 items in the PPVT and 150 in the BPVS.

discrimination. The cut-off points are based on the results of testing 533 children aged 5-8 years but the test can also be applied to older individuals.

Other language processes involved in oral comprehension, include: understanding vocabulary; auditory memory, and an appreciation of syntactic rules. An assessment of the overall process of oral comprehension was made using a non-standardised test (termed the Oral Comprehension Test) based on passages and questions from the Neale Reading Test (Neale, 1958). Three passages of increasing complexity are read out, and after each the subject is asked questions that aim to test his understanding of what he has heard. The questions are scored right or wrong, as indicated in the Neale Reading Test and the number of correct responses are totalled for each subject, so that the totals can be compared between subjects and between groups.

The British Picture Vocabulary Scale was used to provide a measure of receptive vocabulary and as a counterpart to this it was felt necessary to investigate expressive vocabulary. There are few good tests that would have been suitable for use here and it was decided after some consideration to use the upper form of the Expressive One-Word Picture Vocabulary Test (Gardner, 1979). It comprises 70 pictures that are supposedly arranged progressively in order of difficulty. The pictures range from single concrete objects (e.g. wheelbarrow, hammock) to collections of objects that represent abstract concepts (e.g. fuels, communications) and the subject is required to give a single-word response to each item administered. The test was standardised on an American population aged from 12 years to 15 years 11 months and so minor adjustments were made to make it more suitable for a British group. The symbols for 3 items (water, dentist and prescription) were felt to be too obscure and inappropriate for a British population and therefore were removed. Consequently the total score was pro-rated to provide a raw score that was then converted to an age equivalent using the tables provided in the test.

Attainment tests

The two previous studies investigated reading ability using the Schonell Graded Word Recognition tests (Schonell and Schonell, 1960). These tests were not used here since with older subjects a more comprehensive and wide-ranging collection of reading tests was needed to cover the necessary range of abilities and highlight the more subtle handicaps that may be present. The Gray Oral Reading Test Form A (Gray, 1967) was well suited for use here since it is designed to assess the speed and accuracy of oral reading at almost all levels of reading ability from 6-17 years. The complete test consists of 13 short passages of increasing difficulty. Each subject attempts 7 passages around his reading level and the administrator stops the test when the subject makes seven or more errors in two consecutive passages. Episodes classified as errors include: gross or partial mispronunciations; omissions or insertions of words; repetitions; substitutions of words, and changes in word order. The reading of the passages was audio-taped for later scoring. This involved timing the passages and recording the number of errors made, to derive a 'Total Passage Score'. 'Grade Equivalents' are then taken from standardised tables and converted to age equivalents by adding 5 years.

Although there are few data on what happens to reading abilities after the age of 17 years, which is the ceiling of the Gray, Rodgers (1986) reports findings based on the MRC National Survey of Health and Development. The Watts Vernon reading test was administered to individuals at the ages of 15 and 26 years and the results indicated that reading attainment continues to improve between these ages, although development during this period is influenced by many events and circumstances such as further education, employment, health and family background. This indicates that the reading attainment of subjects who score at the ceiling level may be higher than is suggested by an age equivalent of 17 years, an issue that will be returned to in Section B.

Whilst the Gray is used specifically to assess aspects of oral reading, it is possible for subjects to achieve quite high scores without necessarily understanding what they are reading. Although this test does include a short series of comprehension questions relating to each passage there are no norms for these so it was decided to use a written test to assess aspects of reading comprehension.

The Edinburgh Reading Tests (Pollitt, 1977, Stages 1, 2 and 4; McBride and McNaught, 1985, Stage 3) were originally commissioned by the Scottish Education Department and the Educational Institute of Scotland to meet a demand from teachers for a written instrument to help them assess progress in reading. There are 4 levels of the test relating to different reading abilities and each level has four or more sub-tests that are designed to assess different areas of reading competence (e.g. skimming, vocabulary, reading for facts). Shortened versions of the test were derived, under licence from the publishers, for use in a study on the adult progress of those who had severe reading problems as children (Maughan and Hagell, 1989, personal communication), and it was this shortened version that was used here. The relevant stage of the test was administered to each subject and the resulting score was then converted to a reading comprehension age-equivalent using the procedure prescribed in the test. The ceiling age equivalent is 16 years.

The Schonell Graded Word Spelling Test A (Schonell and Schonell, 1960) was used to assess attainment level for spelling. In this test the examiner dictates words that the subject is required to write down. To avoid confusion, especially with respect to homophones, each word is first dictated, next embedded in an explanatory sentence, and then dictated again. The words are graded in order of increasing difficulty and a ceiling of 8 errors in 10 consecutive words applies. A spelling age is then calculated using the following formula: 'spelling age = (number of words correctly spelled/10) + 5 years'. This study used an amended ceiling of 6 errors in 8 consecutive words in order to shorten the test slightly, and to

be compatible with other research being carried out within the Department of Child and Adolescent Psychiatry, and it may have resulted therefore in a slight underestimate of spelling age. The ceiling spelling age equivalent for the test is 15 years.

It should be noted that the Wechsler Objective Reading Dimensions (WORD) test (Wechsler, 1993) would have been a very suitable choice of test here but it was not available at the time of data collection. It has sections measuring Basic Reading, Spelling and Reading Comprehension and a range of age equivalents from 6-16 years. The advantage of this test is that the results can be linked to WISC-III^{UK} (Wechsler, 1992) and WAIS-R norms.

The final test in the attainment assessment battery was a test of written computational ability which required the subject to do 17 basic calculations of increasing difficulty, starting with the most simple addition type and ending with long division. This non-standardised test was adapted from the Rating Scale for Number Ability (Rutter and Bartak, 1973) and yielded a simple raw score that could then be used for comparison between subjects. Other tests of arithmetical attainment were available (e.g. Enright Diagnostic Inventory of Basic Arithmetic Skills; Enright, 1983; Stanford Diagnostic Mathematics Test; Beatty et al. 1976), but they tended to be too complex and take too long to administer. The need here was for a simple test that could be quickly administered, assessed a wide range of ability and was compatible with other research being carried out in the Department of Child and Adolescent Psychiatry.

INTERVIEWS

Informant interview

Informants were asked to provide information about the experiences and functioning of the subjects in a wide range of areas. The questions and codings that were used to provide the

structure for this interview came from several different sources, detailed below, and were gathered together and sub-divided in such a way as to make an interview that flowed naturally and easily. Some extra questions relating to medical history and psychiatric state were added and the result was a new schedule - the Language Follow-Up Interview (LFI) with fourteen sub-sections - living arrangements; level of independence; leisure activities; social and anti-social behaviours; education and work; language; fantasies and daydreams; self-image; sexual relationships and marriage; medical history; maladaptive behaviours; personality characteristics; family history of language difficulties, and parental concerns about the subject.

The questions and codings for the LFI came from four sources. The first of these was the Autism Diagnostic Interview (ADI) (Le Couteur et al., 1989). This schedule was designed to be used with the subject's principal caregiver and aims to provide a lifetime assessment of a range of behaviours relevant to the differential diagnosis of autism in individuals of any chronological age from 5 years to adulthood, and with any mental age level from 2 years upwards. The schedule focuses particularly on the areas that are most relevant to a diagnosis of autism: - the qualities of reciprocal social interaction; communication and language, and repetitive, restricted and stereotyped behaviours. Other behaviours that frequently occur in pervasive developmental disorders but are less crucial for diagnosis (e.g. self-injury, aggression) are also covered. Questions focus predominantly on the child's behaviour in the first five years of life and on current behaviour (that is during the 12 months prior to the interview). Only the questions on current behaviour were used here, since most of the data on early development were available from the earlier studies in this series. The ADI has been shown to yield highly reliable ratings that effectively discriminate between autistic individuals and non-autistic mentally handicapped subjects, and indicate that it is able to distinguish developmental deviance from developmental delay (see Le Couteur et al., 1989, for full reliability data).

The second major source for the LFI was the informant version of the Socio-Emotional Functioning Interview (SEF(I)) (Rutter, Le Couteur, Lord et al., 1988). This was devised to investigate aspects of socio-emotional functioning in high-functioning adults with autism. The broad areas dealt with are: living arrangements; aspects of current work; friendships and social relationships; heterosexual and homosexual relationships; marriage; fantasies; dreams, and self-image. There are 67 items in the SEF(I) and of these, 24 were used in the LFI. Since there were no reliability data available for these measures a separate reliability study was carried out. A colleague of the author who was a clinical psychologist and had been involved in the development of the instrument carried out 10 complete SEF(I) interviews with the parents or other close relatives of 5 high-functioning males with a diagnosis of autism and 5 young men who were receiving out-patient care at the Maudsley hospital for a schizophreniform illness. They were all known to have some problems in the area of social functioning. The subjects ranged in age from 19-45 years with a mean age of 31.8 years (S.D. = 7.8), and they all had WAIS-R verbal and performance IQ's above 70. The interviews were tape-recorded and then rated by the author. It was decided to use weighted kappas (Cohen, 1968) in order to take into account differences in degree of disagreement and these were computed for the 24 items that were used in the LFI. Although there are no objective measures by which to judge kappa coefficients (Dunn, 1995) a rough guide is provided by Landis and Koch (1977). According to these criteria 13 items were in the range described as 'almost perfect agreement' (.81-1.00); 8 were in the 'substantial agreement' range (.61-.80) and 2 were in the 'moderate agreement' range (.41-.60). The actual weighted kappa coefficients are listed in Appendix VI and ranged from .49 to 1.00. The reliability of these items was considered to be acceptable but in order to further improve both these reliabilities and those of other items in the LFI, a series of rating meetings were held between the author, and a senior child psychiatrist and senior psychologist, both of whom had extensive experience of working with autism, and in using all the schedules from which the LFI was created. During these meetings the author raised any cases where the

coding was not clear, and the relevant issues were then debated until agreement was reached on a coding.

Both the above instruments have been developed in association with the Department of Child and Adolescent Psychiatry at the Institute of Psychiatry, London and are investigator-based interviews. This type of interview has several advantages over the alternative respondent-based variety. Investigator-based interviews specify the range of behaviours to be covered and provide details of the predetermined coding for each behavioural item. There is an initial compulsory probe for each behavioural item and the interviewer, who needs to be highly trained, both on how to question effectively, and on the conceptual distinction and differentiation required for each coding, then needs to probe further until there is sufficient information to distinguish which rating should be given to the behaviour in question. This approach is quite different from that used in respondent-based interviews where the questions are precisely worded and the coding is based on whether the respondent says yes or no. The drawback of this latter approach is that it relies on all informants interpreting the question in the same way, and in having the conceptual understanding to make the required distinctions. The investigator-based approach, by using skilled interviewers and a more flexible structure, seems to improve the validity of ratings.

The Vineland Social Maturity Scale (Doll, 1947) was used in the earliest comparison of the groups as a measure of social adaptation. Subsequently, however, there has been a major revision of this - the Vineland Adaptive Behaviour Scales (Sparrow, Balla and Cicchetti, 1984). This is, in many ways, more useful than the previous version since it reports information in a more detailed fashion using a number of different categories and sub-sections. For individuals aged over 6 years it is scored in terms of three domains: Communication; Daily Living Skills, and Socialisation. The mean for each scale is 100 with a standard deviation of 15. These domains are each further divided into three sub-domains

(Communication: expressive, receptive and written; Daily Living Skills: personal, domestic and community; Socialisation: interpersonal relationships, play/leisure time and coping skills). There is also a maladaptive scale that records the presence of behavioural disturbances (e.g. sleep disturbances, aggression, showing a lack of consideration) and the subject's total maladaptive behaviour score can be classified as "nonsignificant", "intermediate" or "significant".

The Vineland Adaptive Behaviour Scales were standardised on a U.S. population using samples of normal children and adults, ranging in age from birth to 18 years. There are three editions of the scale: a survey form which is of use primarily as a diagnostic and classification tool for normal or low functioning children or adults; an expanded form for use in rehabilitative or educational planning, and a classroom edition for use by teachers. In this research the survey form was used. Like the earlier form of the Vineland it is intended to be administered to a parent or other primary caregiver and is in semi-structured interview format. 'Excellent' levels of reliability were reported for each domain and subdomain, and 'good to excellent' reliability for the great majority of individual items. Other analyses demonstrated that the Vineland is a valid instrument in terms of content and construct validity (Sparrow et al., 1984).

The usefulness of this scale in assessing the social deficits of autistic individuals has been reported in several studies (e.g. Szatmari et al., 1989; Volkmar et al., 1987), and it too was incorporated into the LFI.

Subject interview

Where possible, subjects were interviewed using the subject version of the Socio-Emotional Functioning Interview (SEF(S)), first mentioned by Rutter et al. (1988). There is much

overlap between this and the Socio-Emotional Functioning Interview (Informant version), that was incorporated into the Language Follow-Up Interview. The major difference is that the informant version is, with the help of a reliable interviewee, mainly factual, whereas the SEF(S) allows examination of the way in which the subject himself perceives various issues. The interview covers areas such as: friendships; work and work-related problems; sexual relationships; fantasies and daydreams; self-image, and wishes for the future. In addition to the SEF(S) subjects were asked questions about their psychiatric state, current and past, to determine whether they had ever experienced depression, generalised anxiety, obsessional neuroses, delusions or hallucinations.

STANDARDISED VIDEO OBSERVATION

As well as the information collected through interviews and psychometric assessments it was considered important to make some systematic evaluation of the more subtle aspects of social and communicative interactions. Direct observation of the subjects engaged in a social situation was felt to be the most appropriate way to gather this information, and the Autistic Diagnostic Diagnostic Observation Schedule (ADOS) (Lord et al., 1989) was the instrument used to provide both the structure for the situation, and the codings for a range of behaviours. This is a standardised protocol for the observation of social and communicative behaviours associated with autism and was devised for use with all age groups from 3 years upwards. It consists of a series of tasks that have structured and semi-structured presses for interaction and takes approximately 20-30 minutes to administer. There are eight tasks in all, which aim to tap the following target behaviours: requesting help; spontaneous play; reciprocal play; offering help to the examiner; taking turns in a structured task; descriptive gesture and mime; description of agents and actions; telling a sequential story; reciprocal communication, and ability to use language to discuss socio-emotional topics. The quality of the response obtained in each of these situations is then coded.

The inter-rater reliability of the instrument was adequate (*weighted kappas of at least .55 for each item*) for matched samples of autistic and non-autistic mildly mentally handicapped children aged 6-18 years (see Lord et al., 1989, for full reliability data). One important aspect of the schedule is that it allows rating of the quality of behaviours, not just their presence or absence. An algorithm for the diagnosis of autism and corresponding to ICD-10 diagnostic criteria has been developed using the ADOS ratings and was shown to have high validity (Lord et al., 1989) in producing clear diagnostic differences between autistic, mentally handicapped and normal subjects.

In addition to the specific ratings for these tasks and questions there is a series of 43 general ratings that are concerned with various aspects of communicative and social behaviour throughout the interview as a whole and are divided into four areas: reciprocal social interaction; communication/language; stereotyped restricted behaviours; mood and non-specific abnormal behaviours.

The ADOS was used in the current study since it was felt to be a useful way of collecting observational measures of certain social and communicative behaviours, and also so that the algorithm could be used to examine the current diagnostic status of the two groups. The ADOS was administered to all subjects and a video-recording was made of each. The ratings were then made by the author, who had been involved in the reliability and validity studies for the schedule, using a combination of live and video ratings.

EMOTION PRODUCTION AND RECOGNITION TASKS

It has already been reported in Chapter One that, under particular circumstances, individuals with autism seem to have difficulty in producing and recognising certain emotions.

Macdonald and her colleagues (1989) described a battery of instruments that were designed to investigate the recognition and expression of emotional cues in both facial and vocal modalities in autistic subjects. These same tests were used in the current research. There were four tests altogether: - recognition of emotional speech; recognition of facial emotion; facial expression of emotion, and vocal expression of emotion, and each involved the recognition or production of the four emotions that are thought to be the primary emotions to appear in early life - happiness, sadness, anger and fear (Ekman and Friesen, 1975). In addition, there was a neutral (unemotional) category. Macdonald et al. (1989) compared high-functioning autistic adults with normal adults. The autistic subjects were found to be relatively impaired in both the appreciation and production of emotional expression. No one test provided a clear-cut separation of the groups at the individual level but composite scores did separate the groups quite well. The authors suggested that this battery of tasks could be of use in identifying sub-clinical deficits that may be aetiologically linked with autism e.g. in family genetic studies of autism, and they are described in more detail below.

Recognition of emotional speech (filtered speech task)

For the task involving the recognition of emotional speech, subjects were required to listen to an audio-tape consisting of 3 blocks of sentences read by an actor who varied his emotional expression to convey the five different emotion states: happiness, sadness, fear, anger and no emotion. The order of these emotions was randomised across the test trials. Two different methods were used to control the verbal content so that subjects did not interpret the emotionality of the sentence because of the meaning carried by it. In the first block of 18 trials the meaning of the sentence was affectively neutral e.g. 'the peaches and pears in the market were ripe'. The 2 subsequent blocks of 18 sentences had the high frequencies eliminated so that although the words were unintelligible, the emotional meaning carried by certain vocal characteristics of the speech remained. This technique is known as 'filtered speech'. For each trial the subject was asked to make a multiple-choice written judgement

of what the intended emotion was and so for each of the 3 blocks the maximum possible score was 18. Prior to the test trials, subjects completed a series of 22 practice trials.

Recognition of facial expression

Here subjects were asked to match faces, selected from a set of photographs of facial affect (Ekman and Friesen, 1976), with photographs of a context designed to elicit a particular emotion. The 20 context stimuli were black and white photographs, each of which portrayed a different emotional context (e.g. a mother playing with a baby; a driver finding a parking ticket on his car) and were designed to provoke one of the five emotional states described earlier. In each of these photos the face of the individual portrayed was blanked out and the subject was asked to state firstly which emotion this person was feeling, and secondly to match this emotion to a facial expression from a 5-photo array of an actor depicting the 5 emotional states. Four different sets of 5-photo arrays were used, each showing a different actor and with the position of the correct match randomised across the arrays. Subjects completed 6 practice trials prior to the 20 test trials.

Facial expression of emotion

For this task subjects were read a number of short descriptions of situations in which the 5 emotion states might be experienced, each story ending with 'you are feeling....(target emotion)'. After each description the subject was asked to convey this emotion through his facial expression and three head and shoulders photographs were taken each time this was done, using a 35mm camera and a 135 mm telephoto lens, against a standard neutral background. The order in which the 5 emotional states were expressed was varied randomly across the subjects. Before the test trials, the subjects completed 1 practice trial for each emotional state.

The colour photographs measuring 10cm x 15cm were then judged to assess expression of the five emotion states. There were 3 judges, all female postgraduate psychology students. None had met any of the subjects involved. All the photos from all the subjects were pooled and presented to the judges in a random order and during a single session. They were told that each emotion occurred equally often and were asked to make an independent judgement of the emotion intended by each expression and to record this on a multiple-choice response form. In addition to identifying the emotion intended by each expression the judges were asked to rate each photo for oddity on a scale from 0 (not at all odd) to 2 (very odd). Each subject posed for 15 photographs and there were 3 judges so the maximum number of correct identifications of intended emotion per subject was 45, with an oddity score ranging from 0 (not at all odd in any photograph) to 90 (very odd in all photographs).

Vocal expression of emotion

In the task investigating the vocal expression of emotion, subjects were read short descriptions of situations aimed to evoke the 5 emotion states. They were then asked to read an affectively neutral sentence ("the bed was covered with sheets and blankets") into a tape recorder and were instructed that they were to put as much feeling, relevant to the target emotional state, into their voice as possible. The pause button was used with each trial so all that appeared on the recording was the examiner stating the test trial number and then the subject reading the sentence. As a warm-up there were 5 practice trials and then there were 15 test trials with the order of the 15 expressions varied randomly across the subjects.

The tape recordings were then judged. The judges were the same group described above. They were required to listen to the audio-tapes for each subject with the subjects presented in a random order and to record on a response form what they thought the intended emotion was, together with an oddity rating ranging from 0 to 2 as described for the facial modality. As with the photographs the maximum score for each subject was 45 utterances correctly identified, with an oddity score ranging from 0 to 90.

INTERVIEWER/EXAMINER

In the majority of cases the assessments and interviews were carried out by the author herself, but in a few instances it was necessary for colleagues to assist. In 4 cases this arose because informants were somewhat reluctant to be interviewed but agreed when approached by a professional with whom they had experienced prior contact. In another case the subject was visiting the UK from Holland at a time when the author was unavailable, and in a sixth case the subject and informant lived in Australia, and a colleague attending a conference there was able to combine her trip with a visit to the family. Three colleagues in all assisted with the data collection, 1 was a senior child psychiatrist and the other 2 were both clinical psychologists. All had extensive experience of autism and were well-qualified to use the instruments in the assessment battery. The child psychiatrist carried out 3 informant interviews, 2 from the autism group and 1 from the 'mixed group. The first clinical psychologist carried out 2 informant interviews, and 1 subject interview and assessment, all from the autism group. The second psychologist carried out assessment on 1 autistic individual, in association with the author.

MISSING DATA

Substantial amounts of information were obtained for all subjects in the two main groups. All the informant interviews were successfully carried out, although there were a few cases

where data were missing on individual items (e.g. Quality of Friendships) because the informant was not able to give adequate information to make an accurate coding. The great majority of the information that was dependent on direct contact with the subject was also collected, although 1 member of the DLD group would not agree to be seen, and 1 subject from the autism group refused to continue after having partially completed the assessments. In both cases their unwillingness to participate appeared to be due to a wish to leave what were perceived as "past problems" behind them. In addition, 1 subject from the autism group was untestable on all WAIS sub-tests except object assembly. He therefore had to be excluded from any analyses involving Wechsler scores. He did manage to score on many of the other tests in the battery, however, and was included in the analyses where appropriate. This subject and another member of the autism group were also unable to cope with the demands of the Raven's Matrices. A summary of the assessments administered is given in Table 4.1 overleaf, together with the numbers of subjects for whom data in each category were collected.

TABLE 4.1

ASSESSMENTS USED AT TIME 3 WITH NUMBERS OF SUBJECTS COMPLETING EACH TEST

	AUTISM (n=19)	DLD (n=20)
Wechsler Adult Intelligence Scale-Revised (Wechsler 1981)	18	19
Standard Progressive Matrices (Raven 1956)	17	19
British Picture Vocabulary Scales (Dunn et al. 1982). Scores subsequently converted to equivalent scores on Peabody Picture Vocabulary Test (Dunn 1959)	19	19
Expressive One-Word Picture Vocabulary Test (Gardner 1979)	19	19
Auditory Discrimination Test (Wepman 1958)	11	19
Oral Comprehension Test based on Neale Reading Test (Neale 1958)	18	19
Gray Oral Reading Test Form A (Gray 1967)	19	19
Edinburgh Reading Test, abridged form (Maughan & Hagell, personal communication)	19	19
Schonell Graded Word Spelling Test A (Schonell & Schonell 1960)	19	19
Adapted Scale for Number Ability (adapted from Rutter and Bartak 1973)	19	19
Informant Interview (LFI) (Mawhood, see text for details of sources used))	19	20
Autism Diagnostic Observation Schedule (Lord et al. 1989)	18	19
Socio-Emotional Functioning Interview - subject version. SEF(S) (Rutter and Schopler 1988)	13	18
Emotion tasks (Macdonald et al, 1989)	7	13

There were some missing data for the Wepman Auditory Discrimination Test as 8 members of the autism group were untestable either because they were unable to understand the

concepts of 'same' and 'different' or because they had poor attention. In a few instances it was not possible to carry out the standardised video assessment because of technical difficulties or a lack of time (for example when long distances had been travelled to see the subject and it was not possible to arrange another meeting). Although an attempt was made to carry out all the subject interviews, many were not able to cope with the linguistic requirements of the situation and a certain amount of missing data was due to this. Some individuals, mainly from the autism group, were unable to cope with the demands of one or other of the tasks, and in a few other cases it was not possible to complete the tasks, either for technical reasons, or because the subject was unwilling to do so. Consequently the total number of subjects for whom there were complete data on these tasks was 7 in the autism group, and 13 in the DLD group.

CHAPTER FIVE : FINDINGS FROM THE INITIAL COMPARISON AND FIRST FOLLOW-UP OF THE TWO DIAGNOSTIC GROUPS

Before presenting the results of the current follow-up of the two groups into adulthood it is important to give consideration to the results from the initial comparison of the groups in early childhood, and the follow-up comparison that took place in middle childhood. Although these findings have been referred to in earlier chapters, and there is therefore some repetition here, a more detailed breakdown of the results is essential in order to set the scene for the current investigation, and to be able to interpret its findings. In reporting these two sets of results, acknowledgements are due to Bartak (1975) and Cantwell et al. (1989).

THE INITIAL COMPARISON

BACKGROUND TO THE STUDY

The major issue addressed in this first comparison was whether the underlying deficits in autism could be explained solely in terms of language impairment. Consequently it was decided to study children with a severe developmental disorder of receptive language and to look for similarities and differences between those with a diagnosis of autism and those without. Full details of the sample definition and selection procedure are given in Chapter Four.

EXCLUSIONS

It has already been discussed in Chapter Four that 3 members of the DLD group were found to have a recognised and significant hearing loss when seen in adulthood. Because of the likelihood that they constituted a different group from the other DLD individuals they were

excluded from all the analyses in the adult follow-up. To preserve consistency, the data from the two earlier studies have been re-analysed, with these subjects excluded, and it is these results that are presented here. Similarly, since adult follow-up findings on the 'mixed' group are not presented within the main body of this thesis, their results are not included in this chapter. The exclusion of these subjects resulted in a total of 19 individuals in the autism group and 20 in the DLD group.

AGE AT TESTING

The mean age at testing of the children diagnosed as autistic was 7 years 0 months and was 8 years 2 months for those in the DLD group. This difference was significant ($t = -2.46$; $d.f. = 37$; $p = 0.02$) and therefore had to be taken into account in certain of the data analyses described below.

TESTING

Table 5.1 gives details of the tests administered to the children in the initial comparison. A range of other instruments were used at this time but they were not relevant to the issues under investigation in the adult follow-up and so they are not included here.

In addition, parents were interviewed using a standardized investigator-based schedule to obtain a detailed history of the child's language and social development; developmental milestones; current patterns of communication and social behaviour, and any family history of speech and language delay or disorder. The interviewer obtained examples of the children's behaviours and made ratings on the basis of these descriptions.

TABLE 5.1

ASSESSMENTS USED AT TIME 1 WITH NUMBERS OF SUBJECTS COMPLETING EACH TEST

	AUTISM (n=19)	DLD (n=20)
(a) *Non-verbal intelligence*		
WISC Performance Scale (Wechsler, 1949)	12	20
Merrill-Palmer Scale of Mental Tests (Stutsman, 1948)	7	-
Coloured Progressive Matrices (Raven, 1965)	12	19
(b) *Verbal intelligence*		
WISC Verbal Scale (Wechsler, 1949)	9	17
Peabody Picture Vocabulary Test (Dunn, 1959)	17	20
(c) *Language*		
Reynell Developmental Language Scales (Reynell, 1969)	19	20
Test of understanding and expression of gesture (see Bartak, 1975)	16	19
(d) *Reading*		
Graded Word Reading Test R1 (word recognition), (Schonell and Schonell, 1960)	13	18
Silent Reading Test A (comprehension), (Schonell and Schonell, 1960)	4	7
(e) *Social Behaviour*		
Checklist of autistic behaviours following 10 mins. free-play with tester (see Bartak, 1975)	19	20
Vineland Social Maturity Scale (Doll, 1947)	19	20

Unless stated otherwise, it should be assumed that all statistical tests reported here were two-tailed.

RESULTS

Developmental Milestones

A number of developmental milestones were delayed in subjects from both groups. Almost a third of the total subjects were not sitting unaided by 11 months, and similar numbers were not standing whilst holding onto support by 15 months. Nearly half the children were not dry during the day by 4 years of age, and over a third had not achieved bowel control by 4 years of age. A few children were delayed in crawling. Chi-sqare tests were carried out for each milestone but failed to show any significant differences in delay, between the groups. This suggests that both groups had a broadly similar level of developmental delay. The data relating to developmental milestones are summarised in Table 5.2.

TABLE 5.2

DEVELOPMENTAL MILESTONES

Source: Parental report

	AUTISM	DLD	x^{2*}	p
Not sitting unaided by 11 months	3	9	2.65	n.s.
Not crawling by 15 months	1	3	0.22	n.s.
Not standing holding support by 15 months	5	7	0.06	n.s.
Not dry during day by 4 years	11	9	0.24	n.s.
Not clean by 4 years	9	5	1.26	n.s.
TOTAL SUBJECTS	19	20		

** all comparisons include Yates correction and have degrees of freedom = 1*

*Throughout the thesis x^2 is used for chi-square

Language functioning

The assessments did confirm that a receptive language disorder was present in both groups, but the DLD children tended to show a lesser comprehension defect with a mean language age on the Reynell Comprehension Scale A of 5 years 2 months, compared with 3 years 8 months for the autism group. Analysis of variance, with age as covariate, showed that this difference was significant even allowing for the differences in chronological age (*F = 15.4; d.f. = 1, 38; p < 0.001*). A similar difference was found for the comprehension of vocabulary, as assessed by the Peabody Picture Vocabulary Test. The children in the autism group, who were testable (*n = 17*), had a mean standard score of 51.7 (*S.D. = 16.8*) whilst the DLD group (*n = 20*) had a mean standard score of 76.5 (*S.D. = 9.1*). This difference was highly significant and once again analysis of variance, with age as covariate, revealed it could not be accounted for by differences in chronological age (*F= 24.8; d.f. = 1,36; p < 0.001*).

Expressive language was also poorer in the autism group. Expresive language age on the Reynell Expression Scale A was 3 years 5 months in the autism group compared with 4 years 10 months in the DLD group.

The mean utterance length tended to be slightly longer in the DLD group (*mean = 5.25; S.D. = 2.4*) than in the autism group (*mean = 3.68; S.D = 2.3*) but this difference failed to reach the 5% significance level (*t = -1.98; d.f. = 37; n.s.*).

A particular area in which the two groups differed was in their scores on the test of understanding and production of gesture[1], the autistic children scoring at a lower level on all parts of the test. The results from this test are summarised in Table 5.3, below.

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[1]The examiner mimed a range of objects, pictures and words and the subject had to decide which was intended from a choice of three. Then the subject had to use gesture to mime objects, pictures and words. These categories of representation were chosen to be in increasing order of abstraction.

TABLE 5.3

COMPREHENSION AND EXPRESSION OF GESTURE

Source: Test of comprehension and expression of gesture (Bartak, 1975)

	AUTISM (n=16)		DLD (n=19)			
	Mean	*(S.D.)*	Mean	*(S.D.)*	F*	p
Expression						
Objects	4.56	*(2.4)*	6.95	*(2.3)*	7.18	0.01
Pictures	3.88	*(1.8)*	5.79	*(1.9)*	8.43	< 0.01
Words	2.81	*(2.3)*	5.79	*(1.9)*	9.09	0.005
Comprehension						
Objects	4.63	*(2.4)*	6.00	*(0.0)*	5.48	< 0.05
Pictures	3.81	*(2.0)*	5.00	*(0.0)*	5.95	< 0.05
Words	2.44	*(2.5)*	5.00	*(0.0)*	4.48	< 0.05

**Analysis of covariance with age as covariate and degrees of freedom = 1, 34*

These differences could not be accounted for by age, since analysis of covariance between the groups for each section of the test, with age as covariate, showed that the children in the autism group were significantly less able to use gesture to describe the use of objects, or to mime actions named by the tester. They were also significantly less able to comprehend the tester's gestures. Nonetheless although the autism group scored at a generally lower level, the majority were able to comprehend and produce gesture on demand to some extent.

Although the majority could, if requested, produce a limited range of gesture, none of the autism group were reported as using gesture to communicate at home. This contrasted with the report that 5 members (25%) of the DLD group did so, although this difference was not found to be significant ($x^2 = 3.44$; *d.f. = 1; n.s.*). It seems from this finding that children with autism are capable of some gestural communication, but tend not to use it adequately in a free situation. It was also reported that 15 (75%) of the DLD children had shown imaginative

or pretend play, whereas only 6 (*31.5%*) of the children with autism had done so, and this between-groups difference *was* significant ($x^2 = 5.74$; *d.f. = 1; p <0.05*). Taken together these findings suggest that in autism the disability extends beyond spoken language into gesture and 'inner language' more often than in developmental language delay. Details of these items and other language-related functions are given in Table 5.4.

A number of children in each group had been thought to be deaf in the pre-verbal stage because of their limited and inconsistent response to sounds, but the percentages in each group were not significantly different ($x^2 = 1.75$; *d.f. = 1; n.s.*). Although the groups were similar in this respect they differed in their reaction to noise, with the majority of the autism group, but only 3 of the DLD group showing undue sensitivity. Their parents reported distress at certain noises and a placing of the hands over the ears as if to shut out sounds ($x^2 = 18.72$; *d.f. = 1; p < 0.005*). 42.1% of the autism group and 65% of the DLD group had shown abnormal or diminished babble in early childhood but there was no significant difference between the groups for this variable ($x^2 = 1.23$; *d.f. = 1; n.s.*).

Nor was there any difference between the groups in the percentages who had not acquired single words by 2 years ($x^2 = 0.02$; *d.f. = 1; n.s.*) or phrase speech by 2.5 years ($x^2 = 0.14$; *d.f. = 1; n.s.*). 57.9% of the autism group and 65% of the DLD group had not acquired single word speech by the age of 2 years and 89.5% and 80% of the children respectively were not using phrase speech to communicate by the age of 2.5 years.

TABLE 5.4

LANGUAGE AND LANGUAGE-RELATED FUNCTIONS

Source: *Parental report*

	AUTISM (n=19)	DLD (n=20)	x^{2*}	p
(a) *Language modalities other than speech*				
Imaginative play	6	15	5.74	<0.05
Use of gesture to communicate	-	5	3.44	n.s.
(b) *Pre-speech*				
Ever thought deaf	16	12	1.75	n.s.
Unduly sensitive to noise	17	3	18.72	<0.005
Diminished or abnormal babble	8	13	1.23	n.s.
(c) *Language milestones*				
No single words by 2 years	11	13	0.02	n.s.
No phrase speech by 2.5 years	17	16	0.14	n.s.
(d) *Spoken language*				
Articulation defects	10	19	7.08	<0.01
Odd intonation	11	4	4.41	<0.025
Pronoun reversal (you-I) (ever)	11	3	6.04	<0.025
Echolalia (ever)	19	6	17.82	<0.005
Stereotyped utterances (ever)	12	2	9.76	<0.005
Metaphorical language (ever)	7	-	6.65	<0.01
Inappropriate remarks	6	-	5.24	<0.025
(e) *Use of spoken language*				
Regular spontaneous chat	5	16	8.67	<0.01
Regularly gives account of activities in answer to questions	7	16	5.82	<0.05
(f) *Family history of speech disorder*	5	5	0.07	n.s.

**All comparisons include Yates comparison and have degrees of freedom = 1*

The groups were differentiated by various qualities of speech. Articulation problems were found more amongst the DLD children than the autism group, and this is the one aspect of speech in which the DLD children showed more abnormalities ($x^2 = 7.08$; $d.f. = 1$; $p < 0.01$). For every other feature of spoken language in which the groups differed it was the children from the autism group who showed behaviours inconsistent with their level of language maturity. Thus, more showed odd intonation ($x^2 = 4.41$; $d.f. = 1$; $p < 0.025$); more had shown pronominal reversal of 'you' and 'I' ($x^2 = 6.04$; $d.f. = 1$; $p < 0.025$); all had exhibited echolalia in contrast with only 30% of the DLD children ($x^2 = 17.82$; $d.f. = 1$; $p < 0.005$) and more had used stereotyped utterances ($x^2 = 9.76$; d.f. = 1; $p < 0.005$), metaphorical language ($x^2 = 6.65$; $d.f. = 1$; $p < 0.01$) or made inappropriate remarks ($x^2 = 5.24$; $d.f. = 1$; $p < 0.025$). All these features were assessed from parental report.

As well as differences in the quality of their spoken language, the groups differed in the ways that they used language. Only about a quarter of the children in the autism group 'chatted' spontaneously as often as twice a week ($x^2 = 8.67$; $d.f. = 1$; $p < 0.01$). Also, less than half answered questions about such things as activities they had been involved in, as often as twice a week. In contrast most DLD children did so ($x^2 = 5.82$; $d.f. = 1$; $p < 0.05$).

One area of similarity between the groups was in family history of language and speech disorders. In both groups at least a quarter of the children had parents or siblings with a history of language or speech disorder. Whilst this figure was similar in both groups, it was higher than that for the general population (Morley, 1965).

The findings from the Schonell reading tests revealed certain differences between the groups. A number of children, particularly in the autism group were not able to score at the basal level on the test of word recognition (R1), but of those who did, the autism group ($n = 13$) were roughly comparable with the DLD group ($n = 18$). The mean reading quotient for the autism group was 77.7 ($S.D. = 17.9$) as compared with 73.9 ($S.D. = 9.4$) for the DLD

group (*t = 0.74; d.f = 29; n.s.*). This test involves a predominantly mechanical verbal skill, but the R3 test which involves silent reading and understanding (the child is required to read questions about the passage he has just read and write down the answers), was beyond most of the children in the autism group, with only 4 (*21%*) able to do it (*their mean reading quotient = 99.0*). In no case was failure due to the child's inability to write. The difficulties seemed to be in comprehending the questions, and many of the group did not understand the task itself. In contrast slightly more of the DLD children (*n=7, 35%*) were able to complete this test with a mean quotient of 86.4.

Patterns of Cognitive Disability

For the majority of cases the data on performance IQ were derived from the WISC, but there were 7 subjects, all from the autism group, who were initially untestable on the WISC, and they were given the Merrill-Palmer (Stutsman, 1948) instead. Bartak (1975) reports on a comparison of results from administration of the WISC Performance Scale and the non-verbal items of the Merrill-Palmer Scale to a sample of children with autism. The results suggested that IQ scores on the two tests are comparable in this diagnostic group and so it was assumed here that results obtained from the two separate tests could indeed be legitimately combined. There were also problems in obtaining results on the WISC Verbal Scale, with some subjects. Scores were only obtained for 9 members of the autism group, whereas 17 of the DLD group were testable.

A MANOVA analysis of diagnostic group by sub-test scale score was carried out for the verbal and performance scales separately, including all those children for whom results were obtained, and regardless of whether they were obtained on both scales. For the performance scale the analysis showed no overall significant differences between the groups (*F = 1.14; d.f. = 5, 25; n.s.)*. The MANOVA analysis revealed a rather different pattern on the verbal scale, however, revealing overall significant differences between the groups (*F = 4.48; d.f. =*

6, 18; p <0.01). Univariate analysis of variance was then carried out to look at the differences between the groups on the individual sub-tests and the results are summarised in Table 5.5. The only significant difference amongst the performance sub-tests, revealed by univariate analysis of variance, was for block design on which the autism group were superior (*F = 5.70; d.f. = 1, p<0.05*). The univariate analysis of variance for the verbal scale suggested that the groups differed significantly on the Vocabulary (*F = 4.28, d.f. = 1, p<0.05*), Comprehension (*F = 9.20, d.f. = 1, p<0.01*) and Similarities (*F = 8.24, d.f. = 1, p<0.01*) sub-tests. These findings indicated that the groups were performing differently on the verbal scale but not on the performance scale.

TABLE 5.5

WECHSLER SUB-TEST SCALE SCORES

	AUTISM		DLD			
	Mean	*(S.D.)*	Mean	*(S.D.)*	F	p
Performance Scale	*n* =	*12*	*n* =	*20*		
Picture completion	9.5	*(3.2)*	8.9	*(3.7)*	0.18	n.s.
Picture arrangement	7.3	*(2.8)*	7.3	*(1.3)*	0.01	n.s.
Block design	12.3	*(3.1)*	9.7	*(2.8)*	5.70	< 0.05
Object assembly	10.0	*(1.8)*	9.1	*(2.8)*	1.10	n.s.
Digit symbol	8.3	*(3.7)*	7.1	*(3.2)*	0.96	n.s.
Verbal Scale	*n* =	9	*n* =	17		
Information	4.8	*(2.6)*	4.9	*(1.7)*	0.01	n.s.
Digit span	7.2	*(3.0)*	6.3	*(1.6)*	0.97	n.s.
Vocabulary	4.1	*(3.3)*	6.4	*(2.2)*	4.28	0.05
Arithmetic	5.6	*(5.1)*	6.4	*(2.1)*	0.33	n.s.
Comprehension	2.7	*(2.2)*	6.2	*(3.1)*	9.20	< 0.01
Similarities	3.8	*(2.8)*	6.8	*(2.4)*	8.24	< 0.01

A further difference between the two diagnostic groups lay in the relationship between their scores on the Verbal and Performance Scales, and these findings are summarised in Table 5.6.

They show that for both the children with autism ($t = 8.0$; $d.f. = 8$; $p < 0.001$), and for the DLD children ($t = 5.24$; $d.f. = 16$; $p < 0.001$) who were testable on all sub-tests of the WISC, scores were much lower on the Verbal Scale than the Performance Scale. The verbal-

performance discrepancy, however, appeared more marked in the autism group. An IQ contrast score, representing the difference in score when verbal IQ was subtracted from performance IQ was calculated for each subject. The mean contrast score in the autism group was 30.1 IQ points (*S.D. = 10.6*). In the DLD group it was 11.2 IQ points (*S.D. = 8.5*). This difference was highly significant (*t = 4.73; d.f. = 24; p < 0.001*), and showed that the mean difference between verbal and performance IQ was significantly greater for the children in the autism group than for the DLD children.

TABLE 5.6

MEAN SCORES ON WECHSLER SCALES

		Verbal Scale IQ		*Performance Scale IQ*	
	n	Mean	*(S.D.)*	Mean	*(S.D.)*
Autism	9	66.6	*(17.6)*	96.7	*(13.5)*
DLD	17	78.0	*(8.7)*	89.2	*(8.9)*

Results from the Coloured Progressive Matrices were available for 12 of the autism group and 19 of the DLD group. Although the mean in the autism group (*117.3; S.D. = 31.1*) was higher than that in the DLD group (*100.5; S.D. = 18.5*) this difference was not significant (*t= 1.82, d.f. =29, n.s.).* The scores given here were ratio IQ's, calculated by dividing mental age by chronological age.

Socio-behavioural characteristics

The DLD group were as socially mature as they were intellectually. Their mean Vineland social quotient was 93.1 (*S.D. = 23.5*), whereas that of the autism group was 70.2 (*S.D. = 15.0*), suggesting that they were much less socially developed. Taking chronological age into

account, with analysis of covariance, indicated that the difference between the groups was significant over and above differences due to age (*F = 7.61; d.f = 1, 38; p < 0.01*).

A number of other findings indicated significantly greater behavioural disturbance in the autism group. Fourteen members of the autism group (*73.7%*), had, in the past, shown difficulty in adapting to new situations, compared with only 1 DLD individual (*5%*) (x^2*=16.62; d.f = 1; p <0.005*). In addition more of the autism group showed marked quasi-obsessional activities (x^2 *= 13.61; d.f. = 1; p < 0.005*) and ritualistic features (x^2 *= 11.69; d.f. = 1; p < 0.005*). There were no significant differences, however, for resistance to change and attachment to odd objects, both of which are characteristics often associated with autism. It is worth noting that although behavioural abnormalities were more frequent in the autism group they did occur to some extent amongst the DLD subjects. These findings are shown in Table 5.7.

TABLE 5.7

OBSESSIONAL AND RITUALISTIC CHARACTERISTICS (EVER)

Source: *Parental report*

	AUTISM	DLD	x^{2*}	p
Difficulty adapting to new situations	14	1	16.62	<0.005
Quasi-obsessional activities	16	4	13.61	<0.005
Ritualistic activities	13	2	11.69	<0.005
Resistance to change	8	3	2.32	n.s.
Attachment to odd objects	10	4	3.20	n.s.
TOTAL SUBJECTS	19	20		

** all comparisons include Yates' correction and have degrees of freedom = 1*

Taking social characteristics next, very few children in the autism group had their own friends, in contrast to the majority of DLD children, and no members of the autism group engaged in group play with other children, whereas the majority of the DLD children did. Both these differences were highly significant (see Table 5.8). A history of gaze aversion was also common in the autism group but uncommon amongst the DLD children.

TABLE 5.8

SOCIAL CHARACTERISTICS

Source: *Parental report*

	AUTISM	DLD	x^{2*}	p
Gaze aversion (ever)	17	1	24.6	<0.005
Has own friends	3	18	18.7	<0.005
Group play	-	17	25.3	<0.005
Disturbance while shopping	14	1	16.6	<0.005
Disturbance when friends visit	11	-	13.4	<0.005
Disturbance in restaurants	14	2	13.8	<0.005
TOTAL SUBJECTS	19	20		

**all comparisons include Yates' correction and have degrees of freedom = 1*

Many children with autism showed marked disturbances in public situations such as visiting or being visited by relatives; shopping; or visiting hotels, cinemas or restaurants. The difficulties were severe enough in many cases to interfere considerably with family life, whereas this was rare in the other group, see Table 5.8 above.

Taken together these findings showed that the diagnoses of autism and developmental language disorder, as made from case notes, were valid in that they were associated with quite marked social and behavioural differences between the groups.

Discriminant function analysis

The findings up to this point have shown that the two groups differed significantly and substantially in the quality and extent of their cognitive and language handicaps. Several important questions remained to be answered, however (Bartak, Rutter and Cox, 1977). Firstly, how much overlap was there between the two groups? Were the intergroup

differences sufficiently great as to allow diagnostic differentiation at the *individual* as well as the group level? Secondly, how far did the differentiation on linguistic or cognitive features parallel that made on behavioural grounds, i.e. would the *same* children be called autistic if the diagnosis were made solely on the basis of language and intellectual functioning without reference to social relations or behaviour?

These issues were investigated using discriminant function analysis. The variables already found from the data to be associated with substantial differences between the autism and DLD groups, and significant at the 10% level or better, were divided into 5 sub-sets. These were: past history of behavioural disturbance; current behavioural disturbance; past history of deviant language and language-related behaviours; currently deviant language and language-related behaviours, and standardized tests of current cognitive and linguistic abilities. This analysis required complete data and so the 7 children who had not been testable on the WISC performance scale had to be excluded. These were all in the autism group. Full details of the method used, and of the results, are given in Bartak et al. (1977). It should be noted that in this sub-section the current author was dependent on the work of others, and so the results of the discriminant function analysis as reported here, and in Bartak et al. (1977) *do* include the 3 hearing-impaired subjects who were excluded from the rest of the analyses in this chapter.

To summarise the findings from the discriminant function analysis, it was found that there was very clear separation of the two main groups, with little overlap between them. There were only 3 DLD children who were not classified into the same diagnostic group in each of the 5 separate analyses. It was also found that the distinction between autism and DLD could be made as clearly from language features as from social and behavioural criteria. The distinction on the basis of the standardized tests of language and cognition (WISC, Reynell, Raven's Matrices, etc.) was also sharp. One word of caution should be placed on these findings and this arises from the method of discriminant function analysis that was used here. In this design the parameters of the classifiying function were derived from the

data set itself and therefore match that set especially well. This may result in some underestimation of the number of 'misclassifications' (see Hand, 1983). Nonetheless these findings when taken in combination with the other group comparisons that are presented here suggest that the groups did differ considerably. At the time the study was carried out these findings represented a significant advance in determining the nature of the underlying deficit in autism, suggesting that it is as much a cognitive and linguistic disorder as it is a condition involving social and behavioural abnormalities.

FOLLOW-UP INTO MIDDLE CHILDHOOD

BACKGROUND

The aim of the follow-up into middle childhood was to trace the development of autism, by looking at various symptom clusters. A secondary aim was to determine the differential stability of symptomatology over time between the children with a diagnosis of autism and those with developmental language disorder.

The 'mixed' group of the initial study were omitted from the follow-up and in total 29 of the original group were traced and available for study - 15 in the autism group and 14 in the DLD group, including all 3 of the subjects who were later found to be hearing-impaired. As in the earlier sections they were excluded from the analyses presented here, giving a total of 11 subjects in the DLD group, and 26 subjects overall.

This first follow-up of the group took place between 2 and 3 years after the initial study when the children ranged in age from 6 years 6 months to 11 years 6 months. The mean age at follow-up for the autism group was 9 years 0 months and for the DLD group it was 9 years 6 months.

TESTING

The majority of the information obtained in this follow-up came from the same investigator-based interview that had been used in the earlier comparison and this was again administered to parents. Several sections were omitted this time so that it focused only on outcome in: language; peer relations; stereotyped/repetitive behaviours, and public behaviour. In addition, the Performance Scale of the WISC, the Peabody Picture Vocabulary Test and the Reynell Developmental Language Scales were re-administered.

RESULTS OF PSYCHOMETRIC TESTING

At follow-up, performance IQ's on the Wechsler scale were not quite as high as the initial Matrices IQ's, but the means were still well within the normal range (*91.0 for the autism group and 92.4 for the DLD group*) with only 1 child in each group having an IQ below 70 (*65 and 69, respectively*). The children with autism continued to show major deficits in receptive language at follow-up, with only 1 boy having reached the 72-month ceiling on the Reynell comprehension scale. In contrast, there had been much more linguistic progress in the DLD group with 10 of the 11 boys above the ceiling on the Reynell comprehension scale. Likewise with expressive language the DLD group had made more progress; 4 boys in the autism group were above the ceiling as compared with 10 in the DLD group.

As at Time 1 the DLD group had a higher mean score on the PPVT (*76.5 vs. 62.9 in the autism group; S.D.'s 13.8 vs. 28.0, respectively*), but at this timepoint and with a different group composition, the differences between the groups failed to reach the 5% significance level ($t = -1.43$; *d.f.* = 24; *n.s.*).

OVERALL CHANGES IN MAJOR AREAS OF SYMPTOMATOLOGY

The overall outcome of the two diagnostic groups was examined in four major areas of functioning: language; peer relations; stereotyped/repetitive behaviours, and public behaviour. In each of these areas interview questions were combined and specific criteria were developed for good versus poor functioning. "Good" functioning in the area of language was defined as using sentences with mainly correct grammar and being able to report happenings outside the immediate context, plus the absence of immediate or delayed echolalia or pronominal reversal. "Good" functioning in the area of peer relations required appropriate group participation; spontaneous group play; social approaches to other children; having friends and the parents reporting an overall normal quality of peer relations. In order to be rated as "good" for stereotyped/repetitive behaviours there had to be an absence of stereotyped hand mannerisms; other stereotyped mannerisms; rituals; self-injury and particular difficulty in adapting to new situations. "Good" public behaviour was defined as socially acceptable behaviour in all the situations listed (i.e. visiting friends and relatives; shopping; restaurants, cinema; hotels and having friends or relatives visit). The results of the ratings of functioning in these major areas are presented in Table 5.9.

TABLE 5.9

RATINGS OF "POOR" FUNCTIONING IN MAJOR AREAS

Source: *Parental interview*

	AUTISM (n = 15)	DLD (n=11)	x^{2*}	p
Initial comparison				
Language	14 *(93%)*	11 *(100%)*	0.03	n.s.
Peer relations	15 *(100%)*	4 *(36%)*	10.00	<0.005
Repetitive behaviours	14 *(93%)*	7 *(64%)*	1.94	n.s.
Public behaviour	14 *(93%)*	9 *(82%)*	0.08	n.s.
Follow-up comparison				
Language	14 *(93%)*	5 *(45%)*	5.16	<0.05
Peer relations	11 *(73%)*	4 *(36%)*	2.20	n.s.
Repetitive behaviours	14 *(93%)*	3 *(27%)*	9.49	<0.005
Public behaviour	10 *(67%)*	10 *(91%)*	0.96	n.s.

**All comparisons include Yates' correction and have d.f. = 1.*

Table 5.9 shows that initially, for the features assessed from parental report, the children in the autism group were not significantly worse in language functioning than the DLD children ($x^2 = 0.03$; *d.f. = 1; n.s.*). At follow-up, however, the autism group was considerably poorer in language functioning ($x^2 = 5.16$; *d.f. = 1;* $p < 0.05$) suggesting that for features where the group had been similar initially there were now quite large differences.

Taking peer relations next, initially the autism group were significantly poorer in this area ($x^2 = 10.00$; *d.f. = 1;* $p < 0.005$). At follow-up they still had a worse performance that the DLD group, but a number had improved so that the difference was no longer significant ($x^2 = 2.20$; *d.f. = 1; n.s.*).

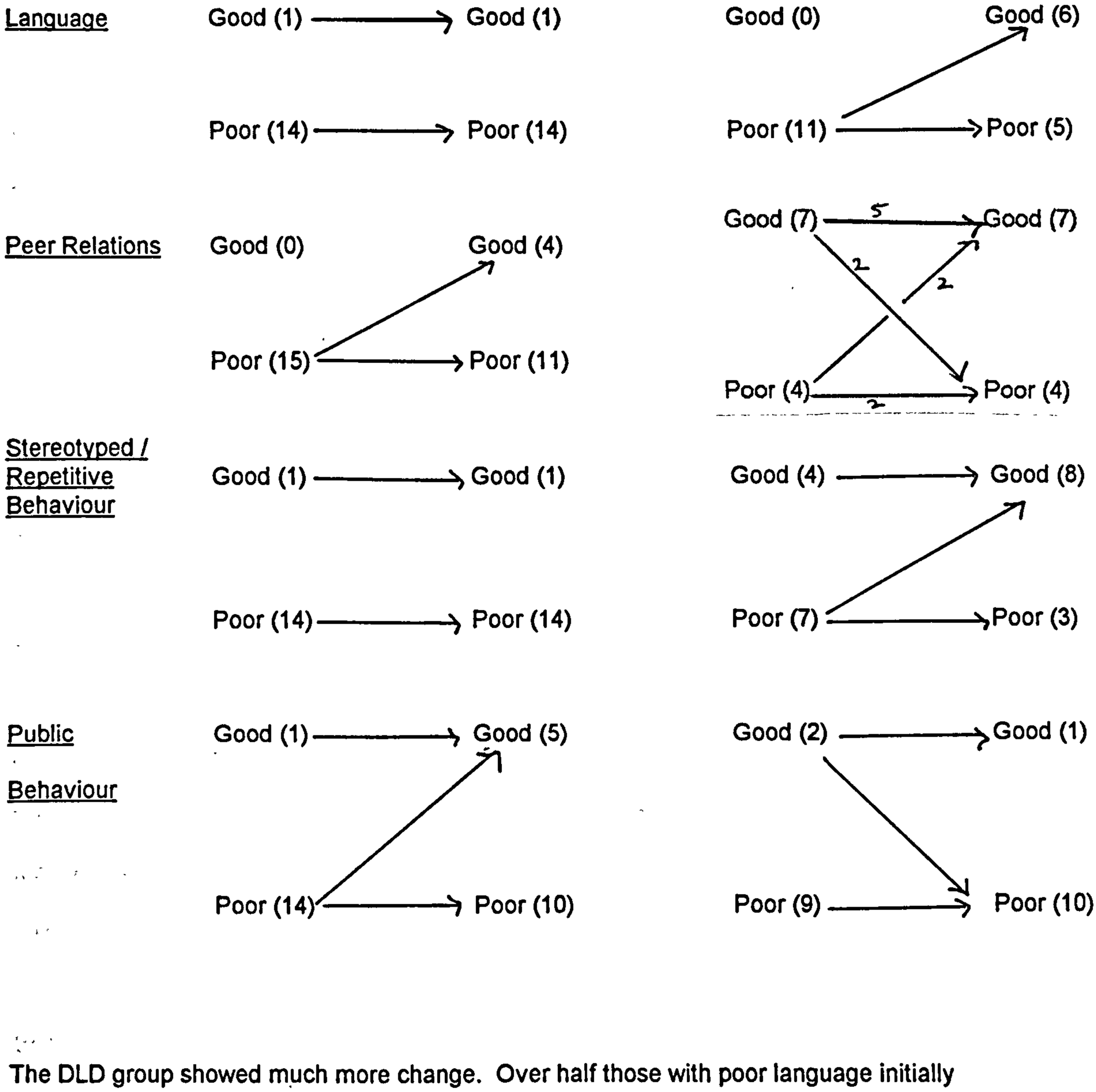
Where DLD children had shown repetitive/stereotyped behaviours in early childhood they tended to have lost them at follow-up. This did not apply to the autism children, so that whereas there had been no significant difference between the groups initially ($x^2 = 1.94$; *d.f. = 1; n.s.*), by follow-up the improvement in the DLD group had resulted in a significant difference between them ($x^2 = 9.49$; *d.f. = 1;* $p < 0.005$).

In the area of disruptive public behaviour the autism group had improved overall, whereas the DLD group displayed a very slight worsening of behaviour. At neither time-point did the differences in functioning between the groups reach the 5% significance level.

Figure 5.1 presents the data showing how *individual* children changed over time in the four major areas of functioning. It can be seen that in general, *no* marked changes occurred in any of the four areas for the autism group, although the proportion with good peer relations and public behaviour increased somewhat. All of the children with autism, who were initially rated as 'good' in any area remained so at follow-up, and most initially rated 'poor' continued to show impaired functioning. The only exceptions were in the areas of peer relations and public behaviour.

FIGURE 5.1

CHANGES FOR INDIVIDUAL CHILDREN



The DLD group showed much more change. Over half those with poor language initially were communicating well at follow-up. But also, of those who had poor function at follow-up, all but 1 (*i.e. 1/5*) were impaired only in their *level* of language skills and not in the presence of abnormal language features. In contrast, this was true of very few members of the autism group. Twelve out of 14 showed abnormal language features at follow-up.

Similarly, of the 7 DLD boys who had shown stereotyped or repetitive behaviour when young, 4 had ceased to show this behaviour at follow-up.

The picture with social behaviour was more complex. Two DLD boys had improved in their social relations (in both cases in spite of continuing to show poor language functioning), but 2 had become substantially worse. One of these showed poor language both initially and at follow-up, but the other had shown a deterioration despite having improved in language functioning.

In the category of disruptive public behaviours, none of the DLD boys showed overall improvement, indeed 1 showed a worsening within this category.

DIFFERENTIATION OF AUTISTIC VERSUS DLD CHILDREN

A number of variables were examined in order to see which differentiated the two groups of children. The interview items that did distinguish between the autism and DLD groups either initially, at follow-up, or at both times are presented in Table 5.10. This gives the data showing the frequency of abnormal responses for each item, both initially and at follow-up, and also shows whether the differences between the two groups were significant at the 5% level.

Both groups had been selected on the basis of a severe language handicap in the presence of normal non-verbal intelligence, and so it was not surprising that many language items did not significantly differentiate the groups, either initially or at follow-up. This applied to a number of items including abnormal response to sound; poor grammar; abnormal speech rhythm; not using language to chat, express wants or comment; metaphorical language and making inappropriate remarks.

Those language items that did differentiate the two groups, at either or both times, are shown in the top section of Table 5.10. These were pronoun reversal; delayed echolalia; articulation defects; stereotyped utterances; not asking to share activities and not reporting outside context. There was more abnormality in the autism group for all items except articulation defects. For two of the language items (not asking to share activities and not reporting outside context), the autism group had become considerably worse at follow-up. These features are aspects of language functioning that were only likely to become overt when the children acquired sufficient spoken language for the observed features to be evident. The one language item where the DLD children were consistently poorer was articulation defects and at follow-up the difference between the two groups had become significant due to some of the autism group having improved whilst the number of DLD children with problems remained the same.

The second section of Table 5.10 presents data on those peer relations and social responsiveness items that differentiated the groups at either or both times. These were gaze avoidance; lacks group participation; lacks own friends and fails to approach other children. Other variables such as abnormal facial expression; not treating parents differently from other adults and failing to show sympathy were not found to differentiate the groups at either time period. Once again it was in the autism group that most abnormalities were present, this being true for all items at both times. It is noteworthy, however, that whereas the autism group showed some improvement for all these items at follow-up, in three of the four items the DLD group showed an *increase* in abnormal symptoms.

The next section gives data on those repetitive/stereotyped behaviour items for which there was a significant difference between the two groups at either or both time periods. These were difficulty in adapting to new situations, self-injury and rituals. As in the previous sections the autism group showed more abnormalities. There was very little evidence of

abnormality in the DLD group and the autism group improved on two items, but showed a worsening of behaviour with regard to self-injury.

The final section in Table 5.10 shows how the two groups compared on social handicap/public behaviour items. Those listed as significant differentiators of the two groups were disruptive behaviour when visiting friends or having friends visit, when shopping, or when visiting restaurants. As before the autistic children showed more abnormalities on all items. They did, however, show improvements at follow-up, whereas the pattern of the DLD group remained more or less similar with percentages on two items staying the same, one improving and one deteriorating.

TABLE 5.10

CHANGES IN FUNCTIONING IN THE TWO GROUPS BETWEEN TIMES 1 AND 2

Source: *Parental Interview*

	INITIAL DATA				FOLLOW-UP DATA			
	Autism (n=15)	DLD (n=11)	x^2 *	p	Autism (n=15)	DLD (n=11)	x^2 *	p
Language items								
Pronoun reversals	10 *67%*	1 *9%*	6.42	<0.025	7 *47%*	1 *9%*	2.63	n.s.
Delayed echolalia	8 *53%*	3 *79%*	0.86	n.s.	8 *53%*	0 *0%*	6.16	<0.025
Articulation defects	7 *47%*	8 *73%*	0.86	n.s.	6 *40%*	10 *91%*	4.96	<0.05
Stereotyped utterances	10 *67%*	1 *9%*	6.42	<0.025	9 *60%*	2 *18%*	2.99	n.s.
Not asking to share activities	7 *47%*	3 *27%*	0.36	n.s.	13 *87%*	4 *36%*	5.05	<0.025
Not reporting outside	8 *53%*	5 *45%*	0.00	n.s.	11 *73%*	1 *9%*	8.11	<0.005
Peer relations and social responsiveness								
Gaze avoidance	9 *60%*	1 *9%*	4.96	<0.05	4 *27%*	0 *0%*	1.72	n.s.

Lacks group participation	14	*93%*	3	*27%*	9.49	<0.005	11 *73%*	4 *36%*	2.20	n.s.
Lacks own friends	11	*73%*	0	*0%*	11.14	<0.001	10 *67%*	3 *27%*	2.52	n.s.
Fails to approach other children	10	*67%*	1	9%	6.42	<0.025	8 *53%*	4 *36%*	0.21	n.s.
Repetitive/stereotyped behaviours										
Cannot adapt to new situations	8	*53%*	0	*0%*	6.16	<0.01	1 *7%*	0 *0%*	0.03	n.s.
Self-injury	2	*13%*	1	*9%*	0.08	n.s.	7 *47%*	0 *0%*	4.85	<0.05
Rituals	9	*60%*	0	*0%*	7.62	<0.01	5 *33%*	0 *0%*	2.65	n.s.
Public behaviours										
Disruptive behaviour when:										
Visiting friends	12	*80%*	2	*18%*	7.43	<0.01	9 *60%*	2 *18%*	2.99	n.s.
Friends visit	8	*53%*	0	*0%*	6.16	<0.025	4 *27%*	1 *9%*	0.38	n.s.
Shopping	10	*67%*	2	*18%*	4.21	<0.05	7 *47%*	2 *18%*	1.19	n.s.
In restaurants	10	*67%*	2	*18%*	4.21	<0.05	2 *13%*	0 *0%*	0.27	n.s.

** all comparisons include Yates' correction and have degrees of freedom = 1*

SUMMARY

The two groups were initially chosen to be comparable and this chapter shows that in some ways they were indeed similar. Thus in both groups there was a broadly similar level of developmental delay and similar mean non-verbal IQ's. In other important respects, however, they differed. The autism group showed more deviant language; a more severe comprehension deficit; a more extensive language disability in that it encompassed several different modalities and a greater deficit in the social use of language. More of the autism group showed quasi-obsessive behaviours; they were significantly less socially developed than the DLD group, and also more disruptive. Both groups showed a verbal-performance discrepancy on cognitive testing, but the difference was more marked in the autism group. These differences need to be taken into account in making sense of the findings from the follow-up into adult life. The progress that was made in the period between early and middle childhood also needs to be considered as the patterns of functioning changed somewhat during this time. Although the autism group were still more socially abnormal at follow-up, the tendency was for them to improve with time, whereas the DLD group showed a relative deterioration over time. Despite their apparent worsening in social functioning the DLD group showed a greater improvement in language than the autism group, with less deviance and more use of language for interactive purposes. The autism group, at follow-up showed more repetitive/stereotyped behaviours and disruptive behaviour.

These two comparisons largely achieved their stated aims and contributed new knowledge concerning both autism and developmental language disorder. The current research moves forward from this point after approximately 17 years, with the benefit of new knowledge that has accumulated from other research initiatives during this period, together with the added strength that comes from being able to examine data over time. It is of especial value that the time in question covers the important developmental changes that take place between childhood and early adulthood.

SECTION B

DESCRIPTION OF CURRENT FUNCTIONING AND COMPARISON OF OUTCOME

In this section, the data relating to the current functioning of both groups are presented. They are arranged under a number of chapter headings:- speech and language; cognitive functioning; social functioning; education and attainment levels; independence; employment experience, and behavioural and psychological functioning. In addition there is a chapter dealing with socio-emotional functioning and pragmatic deficits. Vignettes describing the functioning of the individual subjects, together with the results of psychometric testing at all three time-points are presented as Appendices (V - VIII). The aim of Section B is to describe what the groups are like in early adulthood, and to compare their outcomes on a range of different measures. It is essential to provide this background before moving on to Section C, in which the specific aims of the study are addressed one by one, making use of the findings from this section, and in addition drawing in data from the previous two comparisons.

It should be noted that not all subjects completed all the assessments, and therefore the numbers of subjects contributing to different categories of results vary slightly. As indicated earlier, Table 4.1 provides a summary of where missing data occur.

Here, as elsewhere in the text it should be assumed, unless stated otherwise, that all tests are two-tailed.

CHAPTER SIX: SPEECH AND LANGUAGE

Since this is primarily a study looking at the relations between language functioning and functioning in other areas, it is appropriate to start by describing the current speech and language status of the two groups in some detail.

The data relating to speech and language functioning at Time 3 were derived from three broad sources. Some data were provided by the reports of informants, other information came from direct standardised observation of the subjects and the third category of data came from formal assessments. Below, a description of the data from the first two categories is followed by a section on the data derived from formal assessment.

DATA DERIVED FROM INFORMANT REPORT AND/OR DIRECT STANDARDISED OBSERVATION OF SUBJECTS

The linguistic abilities of the autism group at Time 3 varied greatly as can be seen in Table 6.1. The range was wide, from the 8 subjects (*42.1%*) who had a reasonably good command of spoken language to the single member of the group (*5.3%*) who had no speech at all. A considerable number had still not developed adequate expressive skills, with almost a third having very poor spoken language which, at best, was largely echolalic. The DLD subjects, on the other hand, showed much less variation in their overall level of spoken language and a Mann-Whitney U-test (with corrections for ties) in which the 5 categories in Table 6.1 were ranked from '0' for 'largely correct use of sentences' to '4' for 'no speech', confirmed that their functioning in this area was significantly higher than that of the autism group ($U = 112.5$, $z = -2.47$, $p = 0.01$). None were echolalic and all were using phrase speech. The majority had a reasonably good standard of expressive language, but there were nonetheless a quarter who

were showing persistent difficulties in mastering the syntactic rules of language, with the result that their speech often contained grammatical immaturities.

TABLE 6.1

OVERALL LEVEL OF SPOKEN LANGUAGE

Source: Informant report

	AUTISM		DLD	
	n		n	
Largely correct use of sentences	8	*(42.1%)*	15	*(75%)*
Non-echoed phrase speech but immature grammar	5	*(26.3%)*	5	*(25%)*
Much echolalia but some phrases	2	*(10.5%)*	-	*(0%)*
Few words only	3	*(15.8%)*	-	*(0%)*
No speech	1	*(5.3%)*	-	*(0%)*
TOTAL SUBJECTS	19		20	

U = 112.5, z = -2.47, p = 0.01. These results come from a Mann-Whitney analysis in which the 5 categories above were given ratings from '0' to '4'. The resultant rankings of the subjects ,on this variable ,were then compared between groups.

Table 6.2 gives details of various characteristics of speech and language. The data came from two sources. That described as (a) in the table, from informant report on the Language Follow-Up Interview, and that labelled (b) from the Autism Diagnostic Observation Schedule (ADOS)[1].

Table 6.2 shows that for each of the speech and language characteristics reported, the autism group were showing more difficulties, or had a generally poorer level of performance. When compared with the DLD subjects they were using shorter utterances and had more

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[1]The subject totals given for (a) and (b) differ slightly. See Table 4.1 for details of missing data.

difficulty in understanding both instructions and plots. An 'adequate' rating for utterance length required that the subject's predominant responses should be 6 or more words; 'marginal' was rated if this was 3-6 words, and 'poor' for anything shorter. In order to be coded as 'adequate' in understanding instructions they had to be able to follow and carry out complex instructions involving 2-3 steps (e.g. 'go to the hall and fetch my gloves from the bottom drawer). 'Marginal' understanding meant that the subject could understand simple instructions with fewer than 2 steps and 'poor' understanding was where subjects could learn simple instructions only after frequent repetitions or when used in a familiar context, or if they had little or no apparent understanding at all. With regard to 'understanding plots', subjects were scored as 'adequate' if they could follow and understand a story or the plot from TV, comic strips or books, whilst 'marginal' understanding was scored when they watched TV or looked at books but were only able to comprehend the plot in a limited way, missing the subtleties contained within it. Subjects scored as 'poor' at understanding plots either had little or no response and/or interest in books or TV, or enjoyed the action on TV only (e.g. a car chase), and/or looked at books but didn't follow the story.

Another area where the autistic subjects were poorer was in giving a report of things that they had done, and this difference between the groups was confirmed by direct observation on the Autism Diagnostic Schedule (ADOS). 'Adequate' reporting involved chatting freely and giving a reasonable account of an event (e.g. the day's activities) without needing specific probes, although an initial enquiry may be necessary to start the report off. 'Marginal' reporting ability meant that the subject could give a limited account, responding only to specific probes. 'Poor' was scored either when the subject was not able to give any sort of account, or when they gave information in a very restricted or indirect way (e.g. echoing chunks of conversation or giving excessive detail).

Similarly, the level of conversation tended to be more limited amongst the subjects with autism, and again the information provided by informants was confirmed by observation. In order to be coded as 'adequate' subjects had to 'chat', with a flow of conversation building on

the other person's dialogue. 'Marginal' was scored when they occasionally conversed, but the amount was less than normal or limited in flexibility. Typically the other person would find them rather stilted. 'Poor' was scored either when a subject had very little spontaneous speech, or when they followed their own dialogue in talking to another person, rather than having a reciprocal conversation with interchanges. Full details of the coding categories used in Table 6.2 and of the ranks assigned in the Mann-Whitney U-test, which was used to look for differences between the groups, are given in Appendix XI.

TABLE 6.2

GENERAL CHARACTERISTICS OF SPEECH AND LANGUAGE

Sources: (a) Informant report (b) Direct observation on ADOS

A= 'Adequate', M = 'Marginal', P = 'Poor'

	AUTISM			DLD					
	A	*M*	*P*	*A*	*M*	*P*	U*	z*	p*
Utterance length									
(a)	*11*	*4*	*4*	*20*	*0*	*0*	110.0	-3.03	<0.005
Understanding instructions									
(a)	*12*	*4*	*3*	*19*	*1*	*0*	128.0	-2.25	<0.05
Understanding plots									
(a)	*4*	*4*	*11*	*13*	*7*	*0*	68.0	-3.50	<0.0005
Reporting									
(a)	*4*	*4*	*11*	*11*	*9*	*0*	76.0	-3.21	<0.001
(b)	*2*	*5*	*11*	*12*	*7*	*1*	52.0	-3.78	<0.0005
Conversational abilities									
(a)	*4*	*4*	*11*	*10*	*10*	*0*	80.0	-3.09	<0.005
(b)	*3*	*2*	*13*	*10*	*9*	*1*	64.5	-3.36	<0.001
TOTAL SUBJECTS									
(a)		19			20				
(b)		18			19				

**These results come from Mann-Whitney analyses in which the individual scores for each variable were ranked as described in Appendix XI.*

Although the subjects in the DLD group were functioning overall at more adequate language levels than the autism group it is nonetheless noteworthy that in many cases their communicative abilities were less than fully-developed. 50% (*n = 10*) were reported as having some conversational difficulties, either because the amount was less than normal or because it was limited in flexibility; 45% (*n = 9*) were said to be able to give a report of things that had happened to them but specific probes were necessary to sustain the conversation and 35% (*n = 7*) of the group showed difficulties in understanding plots.

The tests reported in Table 6.2 were repeated tests and with multiple significance testing there is a high probability of finding a significant result just by chance. One way of addressing this issue is to apply the Bonferroni adjustment (Altman, 1991)[2]. There are several fundamental difficulties with this method, however, which are described in detail in Chapter 18 and it was decided not to use it here. Instead it was decided to address this issue by considering the consistency of patterning of the findings across different measures.

The intelligibility of the subjects' speech was also rated from both informant and observational information and a summary is given in Table 6.3. It has already been seen in Table 6.1 that 4 members of the autism group had either no speech at all or could only say a few words. Since the speech of these particular subjects was too limited to allow intelligibility to be assessed adequately they were excluded from these analyses, and as in previous tables there was one member of each group for whom no direct observational data were obtained.

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[2]This requires that each critical p-value is multiplied by the number of tests done (in Table 6.2 this would be 7).

TABLE 6.3

INTELLIGIBILITY OF SPEECH

	AUTISM		DLD	
Source	Total n	Poor	Total n	Poor
Informant report	15	5 *(33.3%)*	20	10 *(50.0%)*
Direct observation	14	5 *(35.7%)*	19	6 *(31.6%)*

A rating of 'poor' was given if informants reported either that the subject had difficulty with certain sounds and so was understood better by family members than others, or if there were definite articulation difficulties such that some whole phrases were difficult to understand. In the observational situation, subjects were rated as 'poor' if the examiner often found their speech difficult to understand due to problems in articulation. Table 6.3 shows that there were indeed a number of subjects in each group who had articulation problems that interfered with the intelligibility of their speech and the findings from the two sources both showed this. The observational data resulted in slightly better ratings of intelligibility for the DLD group than had been suggested by the informant reports. This may be accounted for differences in coding on the two schedules. When the ADOS was first designed it was difficult to achieve adequate inter-rater reliability with more than two coding categories for intelligibility of speech, and so the threshold for a coding of 'poor' was not directly comparable with the informant information which used three coding categories. The Mann-Whitney U-test (with corrections for ties) was used to analyse the informant-based information and details of the ranks allocated are provided in Appendix XI. No significant differences were found (*U= 117.5, z = -1.23, n.s.*). Since only two coding categories were used in the observational information a chi-square test was used to analyse these data. The levels of articulation difficulty based on this information source also appeared to be similar in the two groups (x^2*=0.02, d.f.=1, n.s.*).

In addition to the data on general characteristics described so far, there was observational and informant-based information about features of speech and language that were more deviant. Table 6.4 below, provides a summary of the ratings of these, which were all of the kind typically associated with autism. Once again the 4 members of the autism group who lacked phrase speech were excluded from the analyses. The Mann-Whitney U-test (with corrections for ties) was used to examine differences between the groups, and details of the ranks assigned within each category are given in Appendix XI, together with definitions of 'none', 'marginal' and 'definite'.

TABLE 6.4

DEVIANT FEATURES OF SPEECH AND LANGUAGE

Sources: *(a) Informant report (b) Direct Observation (ADOS)*

N= 'None, M = 'Marginal', D = 'Definite'

	AUTISM			DLD					
	N	*M*	*D*	*N*	*M*	*D*	U**	z**	p**
Echolalia									
(a)	*8*	*5*	*2*	*20*	*0*	*0*	80.0	-3.35	<0.001
(b)	*8*	*2*	*4*	*19*	*0*	*0*	76.0	-3.09	<0.005
Stereotyped phrases									
(a)	*7*	*5*	*3*	*20*	*0*	*0*	70.0	-3.64	<0.0005
(b)	*8*	*3*	*3*	*18*	*1*	*0*	81.5	-2.63	<0.01
Neologisms/ Metaphorical lang.									
(a)	*11*	*4*	*0*	*20*	*0*	*0*	150.0	0.00	n.s.
(b)	*11*	*2*	*1*	*18*	*1*	*0*	111.0	-1.41	n.s.
Pronoun reversal									
(a)	*11*	*2*	*2*	*20*	*0*	*0*	110.0	-2.41	<0.05
(b)	*12*	*0*	*2*	*19*	*0*	*0*	114.0	-1.67	n.s.
Inappropriate questions									
(a)	*11*	*3*	*1*	*18*	*2*	*0*	124.0	-1.32	n.s.
(b)	*13*	*1*	*0*	*18*	*1*	*0*	130.5	-0.22	n.s.
Prosodic oddities									
(a)	*4*	*6*	*5*	*9*	*11*	*0*	95.0	-2.01	<0.05
(b)	*2*	*5*	*7*	*10*	*8*	*1*	69.5	-2.45	0.01
Reduced vocal expressiveness									
(a)	*6*	*4*	*5*	*14*	*6*	*0*	90.0	-2.25	<0.05
TOTAL SUBJECTS									
(a)		15**			20				
(b)		14**			19				

**These results come from Mann-Whitney analyses in which the individual scores for each variable were ranked as described in Appendix XI.*

***The 4 subjects who lacked phrase speech were not included in this table.*

In general the results provided by the reports of informants and those obtained from direct observation were similar, with the presence of a significant difference between the groups being confirmed by observation for echolalia, stereotyped phrases and prosodic oddities.

There was only one instance in which a DLD subject showed definite evidence of a deviant feature and this was a young man who showed prosodic oddities on direct observation. Otherwise all definite cases of linguistic deviance were found in the autism group. They were reported as having significantly higher levels of echolalia, stereotyped phrases, pronoun reversal, prosodic oddities and reduced vocal expressiveness. It is worth noting, nonetheless, that 11 of the DLD group were reported as having slightly odd prosody and this was confirmed by observation for 8 of them. Six were also reported to have reduced vocal expressiveness.

The data considered to this point suggest that the autism group as a whole have language that is both developmentally poorer, and more deviant, than that of the DLD group overall. As well as comparing the two groups, however, it is important to determine the extent to which they show problems when compared with a normal population. The data provided by the communication scale of the Vineland Adaptive Behaviour Scales permit an estimate of this. There are three sub-sections within this scale, covering language functioning in each of the expressive, receptive and written modes. A category that combines the scores within the three modes is also available, giving an overall measure of communicative functioning.

One of the methods of summary offered by the Vineland is the 'adaptive level'. To obtain this, the raw score is converted into a categorical measure of functional adequacy, ranging from 'high' through 'moderately high', 'adequate', and 'moderately low' to 'low', using tables selected according to the subject's chronological age. This measure was used here in preference to the standard score since there were some subjects who scored at ceiling level and some who were below the basal level. Table 6.5 shows the number of subjects who were classified as having adequate functioning, or better, for their age in each of the three language modes, and in overall language functioning. There was 1 member of the autism group for whom no information was available. The Mann-Whitney U-test (with corrections for ties) was used and the ranks assigned were from '0' for 'high' to '4' for 'low', as listed above.

TABLE 6.5

OVERALL ADEQUACY OF COMMUNICATIVE FUNCTIONING

Source: *Vineland Adaptive Behaviour Scales - Communication Section*

	AUTISM (n = 18)	DLD (n=20)			
	Adequate	Adequate	U*	z*	p*
Expressive mode	5 *(27.8%)*	7 *(35.0%)*	134.5	-1.49	n.s.
Receptive mode	8 *(44.4%)*	16 *(80.0%)*	116.0	-2.24	<0.05
Written mode	5 *(27.8%)*	1 *(5.0%)*	149.0	-0.98	n.s.
Overall	4 *(22.2%)*	1 *(5.0%)*	164.5	-0.55	n.s.

**These data are the results of Mann-Whitney analyses in which the scores on each variable were ranked from '0' to '4' as described in the text.*

It can be seen from Table 6.5 that there were quite a few subjects in each group whose level of language functioning was not adequate for their age. The one exception to this pattern was in the receptive mode where the majority of the DLD subjects were categorised as having adequate functioning, and they were in this respect significantly more able than the autism group. Taken overall, these data suggest that in addition to the previously recognised problems in many of the subjects with autism there were also substantial numbers of young men from the DLD group who were experiencing persistent difficulties in communication. 65% were said to have inadequate expressive abilities for their age, and only 1 (5%) had 'adequate' skills in the written mode. Indeed in this mode there were more 'adequate' subjects in the autism group than there were in the DLD group. There were also more subjects in the autism group whose overall communicative functioning was at least 'adequate'. This was in part due to the particular weakness of the DLD subjects in the written mode, but it is clear nonetheless that there were very few subjects from either group whose language impairments had recovered sufficiently by the time they were in their twenties for their overall communicative abilities to be termed 'adequate'.

DATA DERIVED FROM FORMAL ASSESSMENTS

The procedures used for converting the British Picture Vocabulary Test scores to their equivalents on the Peabody Picture Vocabulary Test (PPVT) have already been noted (see Chapter 4), together with the methods by which the standard scores below 40 were extrapolated further to give a more exact score (see Appendix V). Nonetheless, even with this latter procedure there were still 7 subjects (6 with autism and 1 DLD) whose standard scores on the PPVT were below 19, which was as far as the extrapolation could descend with reasonable confidence. Because there were, therefore, a considerable number of subjects for whom exact standard scores were not available, it was decided to use PPVT raw scores in certain of the analyses.

The mean PPVT raw scores of the two groups, for which the maximum possible score was 175, were thus compared. The mean of the DLD group at 115.6 (*S.D. = 23.3*) was significantly higher ($t = -2.26$; $d.f. = 36$, $p < 0.05$) than that of the subjects in the autism group, which was 89.4 (*S.D. = 47.3*), suggesting that their overall understanding of vocabulary was greater. 68.4% (*n=13*) of the autistic subjects, but only 21.1% (*n=4*) of the DLD group, had age equivalents below 10 years, a difference that was significant ($x^2 = 6.81$; $d.f. = 1$, $p < 0.01$). It was noteworthy that the standard deviation in the autism group was twice that in the DLD group. This inevitably raises questions about the level of heterogeneity within the autism group, an issue that will be returned to and developed in Chapter 15.

There were difficulties in analysing the levels of expressive vocabulary in the two groups as 9 (*47.4%*) subjects with autism and 4 (*21.1%*) of the DLD group failed to reach the basal age equivalent of 8 years on the Expressive One-Word Picture Vocabulary Test. It was therefore not possible to calculate means. The median age equivalents of 9 years 5 months in the autism group and 11 years 9 months in the DLD group suggested on first sight that the latter group may have been performing better overall on this test. Examination of the third quartile scores was made, however, in order to look more closely at the spread of scores in the

higher range. The third quartile score was 15 years 8 months in the autism group and 12 years 10 months in the DLD group, and was a further pointer to there being greater overall variability within the former group. Looked at overall, 10 (*52.6%*) of the autism group and 5 (*26.3%*) of the DLD group had age-equivalents below 10 years on this test. When the proportions of subjects scoring above and below 10 years were compared between the two diagnostic groups, using the chi-square test, there were found to be no significant differences (x^2 *= 1.76; d.f. = 1, n.s.*).

The DLD subjects scored significantly better than the autism group on the Oral Comprehension Test. The maximum score for this test was 17 and the mean score for the DLD group was 10.4 (*S.D. = 4.2*), whilst that of the autistic subjects represented a considerably poorer performance at 4.3 (*S.D. = 5.6*), a difference that was highly significant (*t = -3.82; d.f. = 35, p = 0.001*). Despite the overall better performance of the DLD subjects, it should be noted that their scores in general fell far short of the ceiling score in what was a relatively easy test, suggesting that their oral comprehension was still quite impaired.

There did not appear to be any significant differences between the groups on the Wepman Auditory Discrimination Test. Their performance was similar, both in ability to discriminate when two words were different (*t = -0.73; d.f. = 28, n.s.*) and in recognising when the same words were spoken twice (*t = 1.81; d.f. = 28, n.s.*). Results on this test were unavailable for 6 members of the autism group who were untestable either because they were unable to understand the concepts of 'same' and 'different' or because they had poor attention.

SUMMARY

There were indeed a number of important differences between the two groups when their speech and language skills were examined closely, and in nearly all areas where there was a difference it was the DLD group who had the best outcome. Nonetheless, despite having

better overall language levels there were many examples of DLD individuals continuing to experience difficulties in communication, with conversational limitations, difficulty in understanding plots, and immature writing skills being especially common.

CHAPTER SEVEN: COGNITIVE FUNCTIONING

In this chapter the data from the WAIS-R are presented and consideration is given to differences in functioning on the performance and verbal scales. The results from the Raven's Progressive Matrices are also considered as they provide further information on patterns of non-verbal functioning. In addition the data relating to special skills are presented here.

WECHSLER ADULT INTELLIGENCE SCALES (WAIS-R)

The major information on cognitive functioning was provided by the WAIS-R, and Table 7.1, below, shows that the two groups had similar means on both the verbal and performance scales. There was no significant difference between the groups on either of these scales. It is noteworthy, however, that in the autism group the standard deviation for verbal IQ was almost 3 times that in the DLD group, again raising questions about the heterogeneity of the autism group - an issue that will be returned to in Section C.

TABLE 7.1

MEAN SCORES ON WECHSLER ADULT INTELLIGENCE SCALES

	AUTISM (n=18)		DLD (n=19)		t	p
	Mean IQ	*(S.D.)*	Mean IQ	*(S.D.)*		
Verbal IQ	73.3	*(21.7)*	75.3	(7.8)	0.32	n.s.
Performance Scale	82.8	*(13.1)*	78.4	*(10.4)*	1.12	n.s.

Degrees of freedom =35.

Looking at the patterns of scores on the two scales in more detail, however, differences between the groups did become apparent. It is known from research with the Wechsler

scales in normal populations (Wechsler, 1981) that the sub-tests vary substantially in their loadings on verbal and performance factors. Accordingly, the two sub-tests with the highest verbal factor were selected (Comprehension and Vocabulary) as were the two with the highest performance factor (Block Design and Object Assembly). The scale scores for these verbal sub-tests were summed as were those from the performance sub-tests and Table 7.2 summarises the findings.

TABLE 7.2

MEAN SCORES ON SELECTED WECHSLER VERBAL AND PERFORMANCE SUB-TESTS

	AUTISM (n=18)		DLD (n=19)		t	p
	Mean sum of scale scores	*(S.D.)*	Mean sum of scale scores	*(S.D.)*		
Verbal sub-tests (Comprehension and Vocabulary)	9.8	*(8.6)*	10.3	*(3.2)*	0.56	n.s.
Performance sub-tests (Block Design and Object Assembly)	20.6	*(5.9)*	14.6	*(5.2)*	3.32	.002

Degrees of freedom =35.

It can be seen above that when the sub-tests with the highest non-verbal loading are examined, there is a significant difference between the groups, with the autism group having a higher mean performance score. This pattern was not evident on the most highly verbal sub-tests where there was no significant difference between the groups. The autism group overall had performance scores based on these two sub-tests that were 10.8 points (S.D. = 9.7) higher than their verbal scores whilst the mean difference for the DLD group was smaller at 4.3 points (S.D. = 5.2).

Next the pattern of difference between the two scales was examined in both groups. Wechsler (1981) provides data on standard errors for the WAIS-R in this respect, and taking these into account and based on all sub-tests, 10 of the autism group were found to have performance IQ's that were higher than their verbal IQ's, with the discrepancy of a size that would occur in less than 5% of the general population (referred to as the "5% level" in the remainder of this paragraph). Taking the group as a whole their performance scores were on average 9.5 (S.D. = 16.6) IQ points higher than their verbal scores. It should also be noted that there were 3 subjects who showed the opposite pattern with their verbal scores being higher than their performance scores, and the WAIS-R standard error data suggesting that the size of these differences was at the 5% level. Fewer of the DLD group showed a significant difference in scores between the two scales. Four had performance scores that were higher then their verbal scores, with a difference that again was significant at the 5% level taking standard error into account. The average difference for the group as a whole was 3.2 IQ points (S.D. = 9.2) with performance scores being, on average, higher than verbal scores. This was not a significant difference once standard error was taken into account. One subject had a verbal score that was higher than his performance score and significant at the 5% level using the standard error data.

One of the criteria for inclusion in the initial study had been that all subjects should have a performance IQ of above 70 on the WISC. When followed-up into adulthood, however, there were 4 autistic subjects and 3 members of the DLD group who no longer met this criterion. There were also a number of subjects who showed considerable impairment on the language-related tasks, with 9 members of the autism group and 4 DLD subjects having verbal IQ's below 70.

RAVEN'S PROGRESSIVE MATRICES

Further information on non-verbal functioning was provided by the Raven's Progressive Matrices. Two members of the autism group were unable to understand the instructions for this test and so they have missing data, but the mean scores for the subjects who were tested are shown in Table 7.3, below.

TABLE 7.3

MEAN SCORES ON RAVEN'S PROGRESSIVE MATRICES

	Mean 'IQ'	*(S.D.)*	t	p
Autism (n=17)	97.7	*(14.4)*	2.40	n.s.
DLD (n=19)	86.1	*(14.5)*		

degrees of freedom =34

These results showed a similar pattern to those from the WAIS-R Performance scale, so that although the mean score of the autism group was higher than that of the DLD group there was no overall significant difference in the scores of the two groups.

The correlation between the WISC Performance IQ and the Raven's 'IQ' was also examined. For the 17 members of the autism group who had scores on both tests there was a high correlation between the two results (r_S = 0.76; p<0.01). For the 19 members of the DLD group the correlation was much lower, but still, on this sample size, significant (r_S = 0.56; p<0.05).

SPECIAL SKILLS

Information about special abilities that were out of keeping with the subject's general level of ability, and which in certain cases constituted exceptional skills that were considerably above normal levels in the general population, was collected during the course of the Language Follow-Up Interview. A summary of these findings is presented in Table 7.4 This reveals that half the autism group had unusual skills in the areas of memory and visuo-spatial ability, with a few others showing unusually good ability at music or drawing. Amongst the DLD group there was much less evidence of special abilities with only 1 member having unusually good visuo-spatial skills and 3 with particularly good memories. The groups were significantly different on visuo-spatial skills ($U = 63.0$, $z = 3.74$, $p < 0.001$), musical ability ($U = 86.0$, $z = -3.26$, $p = 0.001$) and memory ($U = 86.0$, $z = -2.85$, $p < 0.005$), but not on computational skills ($U = 168.0$, $z = -0.75$, *n.s.*) or drawing ($U = 142.0$, $z = -1.50$, *n.s.*). The basis for ranking used in the Mann-Whitney U-test, is described fully in Appendix XII.

TABLE 7.4

CURRENT SPECIAL SKILLS

Source: Informant report

	AUTISM (n=19)		DLD (n=18)				
	Good[1]	*Unusual*[2]	*Good*[1]	*Unusual*[2]	U*	z*	p
Type of Skill							
Visuo-spatial	1	9	-	1	63.0	3.74	<0.001
Computational	2	-	-	-	168.0	-0.75	n.s.
Music	3	3	1	-	86.0	-3.26	<0.001
Memory	5	9	3	3	86.0	-2.85	<0.005
Drawing	*4*	*2*	*2*	-	142.0	-1.50	n.s.

[1]*Good = Isolated skill/knowledge that is definitely out of keeping with subject's general level of ability but not above general population norms.*
[2]*Unusually good = Isolated skill or knowledge that is definitely above the subject's level of ability and above the general population normal level.*

**These data relate to the findings of the Mann-Whitney analyses in which the scores on each variable were ranked from '0' to '4' as described in Appendix XII.*

Taking some examples of visuo-spatial skills, a subject who was reported to enjoy doing jigsaw puzzles, and to be reasonably skilled at them would be coded as 'good', whereas one who could do a complicated jigsaw puzzle upside down with the sky at the bottom of the picture, or could quickly sort out two large jigsaw puzzles that were mixed up together in a box would be coded 'unusually good'.

There were no instances of 'unusually good' computational ability but 1 of the DLD subjects coded as 'good' was described as being able to add up snooker scores quickly.

A number of subjects had musical talents. One subject who was coded as 'good' was described by his parents as having a 'good ear, and able to recognise a piece of music quickly'. Examples of 'unusually good' skills were being able to pick out instantly if a string is

flat or someone is singing slightly flat, having absolute pitch, and being able to play the cello at a very competent level.

There were reports of many of the subjects having particularly good memories, which appeared to be out of keeping with their general level of abilities and in some cases were 'unusually good'. A 'good' memory was coded for a subject who 'sometimes surprised' his parents with 'the amount of detail he recalled', whereas examples of 'unusually good' memory skills were a subject who could reliably recall details of the entire London bus system and precise dates e.g. 'on 31st July 1982 we had lunch with Peter and June', and a second subject who served as the family 'memory bank' so that they always checked with him if they wanted to recall details of a past event.

Some subjects had 'good' drawing abilities so that they could, for example, draw a car from memory, incorporating quite a lot of detail, but not getting the perspective quite right, whereas the 'unusually good' cases had very good use of perspective and one could draw the London Underground tube map from memory.

Despite having abilities that were out of keeping with their general level of ability, the tendency was for subjects not to use them in any meaningful way. None of the DLD group, and only 3 of the autistic subjects put their skills to any practical use. One who did, was a musically-talented member of the autism group who belonged to a choir, gave clarinet lessons to a young neighbour and wrote songs; another who had unusually good visuo-spatial skills used to repair items such as clocks with small components, and a third played the cello.

The data above serve two valuable functions. Firstly, they provide an indication of the areas in which special talents might lie, and secondly they indicate that the distribution of special talents between the groups is quite different. Since these data are based on a somewhat subjective informant description, however, an attempt was made to define special cognitive skills in a more objective way. Goode and her colleagues (1994), in a follow-up of adults with

autism and an IQ of at least 35, found that 25% of their sample had a special cognitive skill. They defined this as having a Wechsler sub-test standard score that was 1 S.D. or more above the general population mean and 2 S.D.'s or more above the subject's own overall cognitive level. Block Design and Object Assembly were used as indicators of visuo-spatial skills; Digit Span for memory skills, and Arithmetic for computational skills.

The same procedure was followed here and subjects who had standard scores of 13 or more (i.e. 1 S.D. above the general population mean) on any of the four sub-tests were identified. Their mean verbal standard score was calculated using all the verbal sub-tests, as was the mean performance standard score using all the performance sub-tests. Subjects from this group who were found to have a standard score on either Block Design or Object Assembly that was 6 or more points above their mean non-verbal standard score (i.e. 2 S.D.'s) were classified as having an isolated visuo-spatial skill that was both out of keeping with their own level of ability and above the general population normal level. Similarly subjects who had Digit Span or Arithmetic standard scores 6 or more points above their mean verbal standard scores were classified as having an isolated memory or computational skill above the general population level and above their own level of functioning. The skills of 5 members of the autism group who had been reported to have unusually good visuo-spatial skills were confirmed in this way. This finding that approximately one-quarter of the autism group had special cognitive skills was in keeping with the findings reported by Goode and her colleagues, even though the current group were of higher mean IQ. There were no other instances of objectively defined special cognitive skills, however, either in the DLD group at all, or in the autism group for computational or memory skills. It was not possible to provide an objective definition for musical or drawing skills from the data that were available. It is of note that no subjects were classified as having exceptional memory skills, even though 9 members of the autism group were reported to show this characteristic. These subjects, however, were in general described as having an especially good memory for details that interested them or were related to particular preoccupations, such as bus routes, and thus would not necessarily perform well on the Digit Span sub-test.

SUMMARY

In both groups the trend was for non-verbal functioning to be superior to verbal abilities. The difference was, however, statistically significant for more members of the autism group. There was also evidence that some of the autism group had skills out of keeping with their general levels of ability, especially in the area of visuo-spatial functioning. There was little evidence of unusual skills amongst the DLD group. Taken together, these findings suggest that there may be basic differences between the groups in their patterns of cognitive functioning, and also provide support for the argument that both disorders have a cognitive component. This issue will be developed further in Section C.

CHAPTER EIGHT: SOCIAL FUNCTIONING

In this chapter, the data on social functioning are presented under four headings:- 'social behaviours' which covers non-verbal communication and other specific aspects of social interaction; 'social relationships' in which friendships and the ability to make acquaintances are examined; 'heterosexual relationships', lastly the question of how the subjects make use of their leisure time is considered.

SOCIAL BEHAVIOURS

A number of aspects of non-verbal communication were rated during the course of the ADOS and these data are summarised and presented in Table 8.1. There were 2 members of the DLD group and 1 from the autism group for whom there were no observational data on these particular aspects of behaviour.

TABLE 8.1

NON-VERBAL COMMUNICATION

Source: Autism Diagnostic Observation Schedule

	AUTISM (n=18)			DLD (n=18)					
	N	M	D	N	M	D	U*	z*	p*
Smiling	5	4	9	15	3	-	58.5	-3.64	<0.0005
Facial expression	4	6	8	11	7	-	71.0	-3.09	<0.005
Social distance	12	5	1	18	-	-	114.0	-2.64	<0.01
Linkage of non-verbal communication with language production	3	5	10	15	3	-	40.5	-4.24	<0.0001

N= Not odd, M = Marginally odd, D = Definitely odd

**These data are the results of the Mann-Whitney analyses in which the scores on each variable were ranked as described in Appendix XIII.*

The differences between the two groups were highly significant for all the four variables that were observed: smiling; facial expression; social distance and the linkage of general non-verbal communication with vocal production. The Mann-Whitney U-test (with corrections for ties) was used here and a full description of the codings and ranks assigned for each of these variables is given in Appendix XIII. For each behaviour it was the autism group who were the most odd overall, and for smiling, facial expression and linkage of non-verbal communication approximately half the group were rated as markedly odd.

For 'smiling', subjects were scored as 'not odd' if they made appropriate and varied use of smiles, 'marginally odd' if they smiled in a limited or stilted way, and 'definitely odd' if there was no smiling or the smiling was rare or inappropriate. Normality for 'facial expression' required that the subject use a range of appropriate facial expressions, 'marginally odd' was coded when they had a few expressions, but these gave an 'odd' impression because they were stiff, stilted or mechanical in manner, and 'definitely odd' if the expressions were reduced or almost totally lacking.

Subjects were rated as normal for social distance/posture if they had appropriate posture and changes in distance between themselves and the examiner during the ADOS. A 'marginal' coding was given if the examiner thought there was a slightly 'odd' aspect to their distance or posture, e.g. they might sustain a roughly appropriate position, but have limited changes or an over-relaxed or stiff posture. For those who were rated as 'definitely odd', it was clear that their position was inappropriate, either remaining far distant and/or suddenly coming too close.

In order to be rated as having normal linkage of non-verbal communication and language, vocalisations had to be accompanied by subtle and socially appropriate changes in gesture, eye gaze and facial expression. 'Marginal' linkage was coded when vocalisations were accompanied by a limited or less than usual frequency of gesture, eye gaze or facial

expression. 'Definitely odd' was used when subjects had little or no non-verbal communication linked to their language production.

Notwithstanding the differences between the groups there were some DLD individuals who, in these same three areas showed evidence of minor oddities. Three were scored 'marginal' for 'smiling', 7 were found to have slightly odd facial expressions and 3 had minor oddities in linking non-verbal communication with language production.

'Eye-contact' was also observed during the course of the ADOS. This was rated as either 'definitely odd' or 'not odd', with no 'marginally odd' rating, as it had been difficult to get acceptable reliability ratings using three categories when the instrument was first designed. There were clear differences between the two diagnostic groups with the majority (*n = 14; 77.8%*) of the autism group being rated as 'odd', whereas this applied to only 11.1% (*n = 2*) of the DLD individuals ($x^2 = 14.4$; *d.f. = 1, p < 0.005*).

Data on certain other aspects of social behaviour were collected in the informant interview. One of these was 'sense of humour'. Only 2 individuals from the autism group were considered to have a normal and age-appropriate sense of humour with the majority having either a socially inappropriate 'off-beam' sense of humour, or no apparent understanding of humour as understood by other people. Eight members of the DLD group had a normal and age-appropriate sense of humour. This still left, however, the majority of the DLD group, as either immature or very literal in their appreciation of humour. Nonetheless the differences between the groups were highly significant (*U = 63.0;, z = -3.58, p < 0.0005*). Details of the ranks used in the Mann-Whitney U-test are provided in Appendix XIII.

Three of the autism group were reported to have little or no understanding of turn-taking in situations such as playing board games and a further 4 had some limited understanding and could participate with prompting. None of the DLD group had any difficulty in this area and consequently the differences between the groups were highly significant (*U = 110; z = -3.03,*

p < 0.005). With regard to understanding rules in games, 3 of the autism group had little or no understanding of rules, whilst a further 5 had only a limited appreciation of the details of rules. There was 1 member of the DLD group who showed this latter difficulty but none had a complete lack of understanding, and again the differences between the groups were highly significant (*U = 108.5; z = -2.85, p < 0.005*). See Appendix XIII. for details of the ranks used in the Mann-Whitney U-tests for both turn-taking and understanding rules.

TABLE 8.2

SOCIAL BEHAVIOURS AND RESPONSES

Sources: (a) Informant report (b) Direct observation on ADOS

A= 'Adequate', M = 'Marginal', P = 'Poor'

	AUTISM			DLD					
	A	M	P	A	M	P	U*	Z*	p*
Greeting behaviour									
(a)	6	7	6	16	4	-	86.0	-3.27	<0.001
(b)	*4*	*3*	*11*	*12*	*7*	-	62.5	-3.53	<0.0005
Quality of social overtures									
(a)	*4*	*7*	*8*	*18*	*2*	-	40.0	-4.63	<0.0001
(b)	*1*	*5*	*12*	*11*	*8*	-	33.5	-4.38	<0.005
Quality of social response									
(a)	*4*	*8*	*7*	*14*	*6*	-	76.0	-3.47	<0.0005
(b)	-	*6*	*12*	*8*	*11*	-	33.0	-4.50	<0.0001
Rapport with ADOS examiner									
(b)	*2*	*4*	*12*	*10*	*9*	-	46.0	-4.00	0.0001
Shared enjoyment in social interaction									
(a)	*4*	*4*	*11*	*17*	*3*	-	52.0	-4.29	<0.0001
(b)	*6*	*3*	*9*	*17*	*2*	-	66.0	-3.69	<0.0005
TOTAL SUBJECTS									
(a)		19		20					
(b)		18		19					

**These data are the results of the Mann-Whitney analyses in which the scores on each variable were ranked as described in Appendix XIII.*

Information on the subjects' specific behaviours and responses during general social interactions was gathered through informant interviews, direct observation on the ADOS and in some cases from both sources. These data are brought together and summarised in Table 8.2.

It is clear from this table that the autism group were significantly less socially developed and adept than were the DLD group. They showed a reduced greeting response; made fewer social overtures and those they made were more inappropriate; their social responses were more limited and inappropriate; they were less able to enter into the 'spirit' of an occasion or interaction and their rapport with the ADOS examiner was poorer. All these differences between the groups were highly significant. There were, however, examples in each category, of DLD individuals who were rated as marginally impaired because their behaviour was reduced in frequency or quality or because their response was awkward. Almost half the group, for example, were considered by the ADOS examiner to be awkward or stilted in their interaction, although there were some comfortable periods of interaction. In 2 of the cases where informant reports were supplemented by direct observation (quality of social overtures and quality of social response) the ratings tended to be more impaired on the ADOS suggesting that there may have been some under-reporting of problems in the informant reports. A full description of the codings used for each of the variables in Table 8.2, and of the ranks used in the Mann-Whitney U-test are provided in Appendix XIII.

SOCIAL RELATIONSHIPS

Information on how the social functioning of the subjects compared with that in the general population was provided by the Socialisation sub-section of the Vineland Adaptive Behaviour Scales. There was a significant difference between the two groups when the Socialisation standard score was compared ($t = 3.21$; $d.f. = 36$, $p < 0.005$), with the mean of the DLD subjects ($X = 73.8$; $S.D. = 22.0$) being higher than that in the autism group ($X = 46.4$; $S.D. =$

30.3). It is clear from these means that the overall levels of social functioning in both groups were considerably below what would be normal for their age[1]. In addition to the information provided by the standard score for Socialisation there were data on the levels of adequacy reached by the subjects in each of three sub-sections: - 'Interpersonal Relationships' which covers how the individual interacts with others; 'Play and Leisure Time' which is concerned with how the subject plays and uses leisure time, and 'Coping Skills' which provides information on how the individual demonstrates responsibility and sensitivity to others. The data relating to these sub-sections and to the overall category of Socialisation are summarised in Table 8.3, where they are presented as the numbers and percentages within each diagnostic group who were functioning at levels defined in the Vineland Schedule as 'adequate' or better, for their age. There was no information available for one member of the autism group.

TABLE 8.3

SOCIALISATION - FUNCTIONAL ADEQUACY

Source: Vineland Adaptive Behaviour Scales

	AUTISM (n = 18)	DLD (n = 20)			
	Adequate	Adequate	U*	z*	p*
Sub-section					
Interpersonal relationships	3 *(16.7%)*	9 *(45%)*	98.0	-2.68	<0.01
Play and leisure	4 *(22.2%)*	6 *(30%)*	145.0	-1.14	n.s.
Coping skills	4 *(22.2%)*	9 *(45%)*	122.0	-1.36	n.s.
Overall socialisation	3 *(16.7%)*	6 *(30%)*	96.0	-2.50	0.01

**These data are the results of the Mann-Whitney analyses in which the scores on each variable were ranked from '0' to '4' as described in Appendix XIII.*

[1] Sparrow et al. (1984) cite a standard score mean of 99.4 (S.D. = 15.0) for the upper age-band (16.0 - 18.11 years) in their standardization sample.

It is clear from Table 8.3 that very few members of the autism group were showing 'adequate' functioning in any of the Socialisation sub-domains. Although more of the DLD subjects had reached this level, and they were overall significantly stronger than the autism group in the area of Interpersonal Relationships and in overall social functioning, there were still, nonetheless, fewer than half of the individuals in the DLD group who were functionally adequate in any of the sub-domains, or in the category as a whole. The Mann-Whitney U-test (with corrections for ties) used the ranks '0' for 'high functional adequacy' to '4' for 'low functional adequacy'.

Further information on social relationships came from the informant-based data. One variable that was investigated was 'ability to make acquaintances', (e.g. talking to people they had not met before at a party, or conversing with shopkeepers). This information is summarised in Table 8.4 and reveals that almost half the autism group had few or no casual social contacts, whilst a further third did make social contacts but tended to be rather limited or awkward in their approaches to these. Two of the individuals in the autism group were reported as having normal abilities in making social contacts and a further subject had an unusually extensive range of acquaintances in that he would talk at length to people in bus queues, shops, etc. A higher percentage of the DLD subjects were said to have a normal range of acquaintances, but nonetheless there were still almost half the group who were limited or awkward in their social contacts. Two members of the group rarely if ever made acquaintances and a further 3 had an unusually extensive range, again making contact with people in shops, or on buses for example, in a rather uninhibited way. Full details of the ranks used in the Mann-Whitney U-test are given in Appendix XIII, and for the purposes of this analysis the cases who had an extensive range of acquaintances were reclassified and combined with the category 'limited or awkward when making contact'. Overall the DLD group were significantly more able to make acquaintances than were the autism group ($U = 108.0$, $z = -2.55$, $p = 0.01$).

TABLE 8.4

MAKING ACQUAINTANCES

Source: *Informant report*

	AUTISM	DLD
	n	n
Normal range of acquaintances	2 *(10.5%)*	6 *(30%)*
Limited or awkward when making contact	7 *(36.8%)*	9 *(45%)*
Little or no making of acquaintances	9 *(47.4%)*	2 (10%)
Unusually extensive range of acquaintances	1 *(5.3%)*	3 *(15%)*
TOTAL SUBJECTS	19	20

The ultimate test of social functioning, however, was whether the subjects had any real experience of friendship and Table 8.5 summarises these findings. There was 1 member of the DLD group for whom no information was available.

TABLE 8.5

FRIENDSHIP RATINGS

Source: *Informant report*

	AUTISM	DLD
	n	n
Has one or more friends of roughly own age with whom shares a variety of interests and social activities	3 *(15.8%)*	5 *(26.3%)*
Has one or more 'friends' with whom meets to share interests but these rather stereotyped and little spontaneous socialising	1 *(5.3%)*	7 *(36.8%)*
Acquaintances with whom talks and/or shares activities in arranged social groups but who are not met otherwise, or on the subject's own initiative	6 *(31.6%)*	1 *(5.3%)*
No particular friends with whom any shared activities	9 *(47.4%)*	6 *(31.6%)*
TOTAL SUBJECTS	19	19

Very few members of the autism group had any real friends, although 3 were reported to have normal relationships, which were defined as 'being with a person of approximately their own age and sharing activities with that person outside a formal group setting'. The relationship also needed to involve 'definite reciprocity and mutual responsiveness' to qualify as a 'normal friendship'. A further individual had a rather limited, stereotyped friendship but the remainder had no particular friends, although they might have acquaintances with whom they shared activities in arranged social groups. Although 12 of the DLD individuals had some experience of friendship, for 7 of these the experience was somewhat limited, either by the interests they shared being restricted (e.g. only meeting in the context of an interest in buses), or because the relationship showed less than normal responsiveness/reciprocity. In addition there were over a third of the group who had no particular friends. The groups did not differ significantly in their levels of friendship ($U = 126.0$, $z = -1.66$, *n.s.*), on the Mann-Whitney U-test (with corrections for ties) when the codings were ranked in order as follows: - 'normal relationship'; 'some limited friendship(s)'; 'no friends, but has acquaintances who are

met in a group situation, such as work or a club';' no friendships involving selectivity and sharing'.

Despite their lack of close social contacts very few subjects had any apparent feelings of loneliness. Amongst the autism group, 12 (*80%*) of those who had no friends were thought by informants to have little or no feelings of loneliness or isolation. A further 2 (*13.3%*) would have liked more social interaction but did not express these wishes as real loneliness. Of the 4 individuals with autism who did have some friendships, 2 did express feelings of loneliness on occasions. The findings were similar in the DLD group. Of those who had no friends, half did not appear to be lonely and although the other half had a desire for more social interaction their expression of loneliness was limited. Of those who did have friends 2 (*16.7%*) were lonely on occasions and a further 2 (*16.7%*) had a further wish for social interaction but with a limited expression of loneliness.

Teasing was a problem for some of the subjects. Amongst the individuals with autism 1 was teased very frequently and 5 had more than the usual amount of teasing. None, however, were tormented to the marked degree suffered by 2 of the DLD subjects. They were set up by others in situations which would make them look ridiculous or emotionally exposed. One was taken to a night-club and given alcohol until he was very drunk. He was then persuaded to sing in front of everyone. The other was told by work colleagues that his father had died and they watched as he left for home in a state of panic. Four other members of the DLD group had some occasional teasing. There were no significant differences between the groups on this measure (*U = 170.0; z =-0.04, n.s.*), using the Mann-Whitney test with ranks assigned as given in Appendix XIII.

SEXUAL RELATIONSHIPS

Table 8.6, overleaf, gives details of the subjects' experiences of sexual relationships.

TABLE 8.6

SEXUAL RELATIONSHIPS

	AUTISM	DLD
Married	- *(0%)*	3 (15%)
Has a girlfriend with whom has a close relationship	- *(0%)*	2 (10%)
Has had a girlfriend in past with whom had a close relationship	1 *(5.3%)*	1 *(5%)*
Has had friends who are girls but not close relationships	1 *(5.3%)*	3 *(15%)*
No girlfriend ever	17 *(89.5%)*	9 *(45%)*
No information available	- *(0%)*	2 *(10%)*
TOTAL SUBJECTS	19	20

Three (15%) of the DLD group were married, and there were 3 individuals (15%) who had experienced a close sexual relationship, either currently or in the past. Nonetheless this still left two-thirds of the DLD group, for whom information was available, who had never had a close sexual relationship, despite being in their twenties. There was 1 individual who had shown homosexual inclinations since he was at school, although he had never, as far as was known, had any close homosexual relationships. Only 1 of the autism group had ever had a close heterosexual relationship, and none was married. In contrast, Farrell (1978), in a British survey found that 69% of boys had experienced sexual intercourse by the age of 18.

Turning to the *quality* of the relationships that they had experienced, the individual from the autism group who had had a girlfriend did appear to have had an emotionally intense relationship with his partner, clearly missing her when they were apart and with evidence of strongly positive emotions when she was with him. It appeared that these emotions were also reciprocated by her, and although they apparently showed some physical

demonstrativeness by kissing and cuddling, they did not ever have sexual intercourse. The four married members of the DLD group, as well as the individual who had a current girlfriend, also seemed to have experienced relationships that were close in quality. Amongst the remaining subjects, 7 members of the autism group and 2 DLD individuals had at some time shown a degree of emotional attachment, but this was either not reciprocated or the attachment was to a person with whom they had no personal relationship, such as a pop star. Ten of the autism group and 7 of the DLD group appeared to have had no heterosexual attachments at all. Information on the quality of relationships was not available for 5 individuals from the DLD group. In all these cases this was because the subjects were uncommunicative about their relationships and the informants felt unable to comment on their quality.

Table 8.7 provides a summary showing how many subjects lacked either friendships, heterosexual relationships or both.

TABLE 8.7

THE INTERACTION BETWEEN SOCIAL RELATIONSHIPS AND CLOSE HETEROSEXUAL RELATIONSHIPS

	AUTISM	DLD
Has both close social relationships and experience of close heterosexual relationships	1 *(5.3%)*	5 *(25%)*
Has experienced close social relationships only	3 *(15.8%)*	6 *(30%)*
Has experienced neither close social relationships, nor close heterosexual relationships	15 *(79.0%)*	6 *(30%)*
Not known	- *(0%)*	3 *(15%)*
TOTAL SUBJECTS	19	20

It is clear from this summary that the vast majority of the autism group lacked both social and heterosexual relationships. About a third of the DLD subjects had both social and

heterosexual relationships, another third had only social relationships and the final third lacked both types of relationship.

LEISURE ACTIVITIES

During the course of the informant interviews, questions were asked about how the subjects used their leisure time both in the home, and outside the home environment. The information about the first of these categories is summarised in Table 8.8, below. There was no information available for 1 member of the autism group.

TABLE 8.8

LEISURE ACTIVITIES IN THE HOME

Source: Informant report

	AUTISM	DLD
	n	n
Varied range of interests	4 *(22.2%)*	6 *(30%)*
Somewhat limited range of interests	8 *(44.4%)*	14 *(70%)*
Very limited range of interests	5 *(27.7%)*	- *(0%)*
No interests	1 *(5.6%)*	- *(0%)*
TOTAL SUBJECTS	18	20

It is clear from Table 8.8 that it was the autism group who showed the greatest impairments in their use of leisure time at home. A third had either a very limited range of interests and would tend to do the same activity for many hours without appreciable variety or selection, or they showed little or no evidence of selection or variety in *any* activities. One subject, for example, would look at books on the Royal Family for hours on end, showing little variety in his activities or ability to organise his spare time. Although all the DLD subjects had at least

some hobbies or interests in the home, for the majority the range of interests was somewhat limited. One studied bus timetables for hours, but also organised his time so that he could watch some TV. He was hoping to take on an ice-cream round and would spend long periods of time practising 'sums' so that he would be proficient at giving out change. Apart from these activities he had few interests. Another member of the group, on the other hand, who was classified as having a 'varied range of interests' took part in a wider spectrum of activities that included making models from matchsticks, doing jigsaw puzzles, watching TV and listening to music.

Taken overall there was no significant difference between the groups in terms of their levels of involvement in leisure activities at home. The Mann-Whitney U-test (with corrections for ties) was used here, and the ranks assigned were those in Table 8.8, where '0' was 'varied range of interests' and '3' was 'no interests'. (*U = 124.0; z = -1.85, n.s.*).

In Table 8.9, overleaf, there is a summary of the information pertaining to leisure activities outside the home environment. The difference between the groups was just significant (*U = 113.5; z = -2.02, p < 0.05*), with the DLD group having the wider range of regular, outside leisure activities. Again the Mann-Whitney U-test (with corrections for ties) was used here and the ranks assigned were those in Table 8.9 where '0' was 'engages in a range of activities on own initiative' and '3' was 'leisure activities arranged by others'. Although overall they were more normal in this respect, there were nonetheless a number of individuals in the DLD group who were not engaging in the types of leisure activities that might be thought normal for young men in their twenties. Five of these individuals went to public places alone, but had few adult-type interests. Of these: 3 would spend hours watching the traffic and other activities going on around them; another would go to a large bus station to look at buses and collect bus numbers, and another with a special interest in buses would go off on bus journeys by himself. A sixth member of the DLD group attended a Social Education Centre during the day, and would often attend evening activities that the Centre arranged, although he did not arrange any leisure activities himself. Just over a quarter of the autism

group engaged regularly in a range of outside activities on their own initiative, but nonetheless there were still over half the group who did not arrange any leisure activities on their own initiative although they might take part in those that others arranged for them.

TABLE 8.9

LEISURE ACTIVITIES OUTSIDE THE HOME ENVIRONMENT

Source: Informant report

	AUTISM	DLD
	n	n
Engages regularly in a range of activities (e.g. cinema, music, sport) on own initiative	5 *(27.8%)*	6 *(30%)*
Engages in activities on own initiative, but infrequently	2 *(11.1%)*	8 *(40%)*
May go to public places alone but few spontaneous adult-type interests	1 *(5.6%)*	5 *(25%)*
Leisure activities arranged by others	10 *(55.6%)*	1 *(5%)*
TOTAL SUBJECTS	18	20

The suggestion that use of leisure time in the DLD group was at levels below normal for their age was confirmed when the data from the Play and Leisure sub-section of the Vineland Adaptive Behaviour Scales were analysed. This sub-section is concerned with how the individual makes use of his leisure time. When the age-equivalents on this scale were compared between the groups, the DLD subjects were found to be functioning at higher levels overall than the autism group ($t = 2.45$; $d.f. = 36$, $p = 0.05$). The mean age-equivalent in the DLD group, however, was 12 years 11 months (*S.D. = 4 years 3 months*) which was clearly well below the ceiling age-equivalent for the sub-section. This was 18 years 11 months and 80% of the DLD individuals failed to reach this level. The mean age-equivalent in the autism group was 8 years 2 months (*S.D. = 6 years 6 months*) and here 88.9% of the group failed to score at the ceiling level.

SUMMARY

The autism group were more abnormal than the DLD group in almost every aspect of social functioning that was examined. It was also clear, however, from many of the analyses that a considerable number of the DLD group were displaying odd or immature functioning, with only about a quarter having any experience of friendship that might be termed 'normal', and the majority of the group rated as having age-equivalent scores well below their chronological age on the Vineland Socialization Scales.

CHAPTER NINE: EDUCATION AND ATTAINMENT LEVELS

This chapter describes the types of schooling and higher education received by the subjects. Their levels of attainment are then investigated in the domains of reading accuracy, reading comprehension, spelling and arithmetic.

SCHOOL PLACEMENT

A complete history of the different types of schools attended by each of the subjects was drawn up. It showed that the children in the autism group were more likely to have had the benefit of specialist education than were those in the DLD group and a summary of this information is presented in Appendix XIV. The current section, however, is more concerned with the types of schools that subjects were attending at the *end* of their school careers and Table 9.1, below, provides a summary of this information.

TABLE 9.1

TYPE OF SCHOOL ATTENDED AT SCHOOL-LEAVING AGE

	AUTISM	DLD
Type of School,		
Ordinary Secondary	3 *(15.8%)*	9 *(45%)*
Special stream in ordinary secondary	- *(0%)*	2 *(10%)*
Specialist school for language disorders	- *(0%)*	1 *(5%)*
Specialist school for autism	9 *(47.4%)*	- *(0%)*
School for moderate learning difficulties	- *(0%)*	5 *(25%)*
School for severe learning difficulties	1 *(5.3%)*	- *(0%)*
Other categories*	6 *(31.6%)*	3 *(15%)*
TOTAL SUBJECTS	19	20

**Other categories = maladjusted, mixed handicap, assessment centre*

Table 9.1 shows that whilst almost half the autism group were in specialist schools for autism at school-leaving age, only 1 member of the DLD group was still receiving help in a school that specialised in language disorders. Over half the DLD group, on the other hand, were attending ordinary secondary schools, but this was the case for only 3 members of the autism group. For those subjects who were not in the ordinary school system, or receiving very specialised education, the educational provision was very varied. A quarter of the DLD group were placed in schools for moderate learning difficulties; 2 attended schools catering for a very mixed range of physical and mental handicaps, and 1 was in a residential assessment centre where he was sent after he made sexual advances to other boys. Amongst the autism group, 1 was in a school for severe learning difficulties; 3 were placed in schools catering mainly for maladjusted children, and a further 3 were attending schools with a very mixed clientele.

The individuals in the autism group tended to stay at school longer than the DLD subjects, the majority of whom left at 16 years. The mean school-leaving age for the autism group was 17.9 years (*S.D. = 1.5 years*), whilst for the DLD group it was 16.2 years (*S.D. = 0.7 years*). This difference in school-leaving age was significant ($t = 4.04$; $d.f. = 32$, $p = 0.001$). Five of the autism group were excluded from this analysis since their education took place within the context of a residential placement and as they had continued to live within this setting as adults, they had no clear-cut school-leaving age.

HIGHER EDUCATION

By far the majority of the subjects had no further education and Table 9.2 summarises the information relating to this.

TABLE 9.2

HIGHER EDUCATION

	AUTISM	DLD
Type of Higher Education		
University/Polytechnic	2 *(10.5%)*	- *(0%)*
College for A'Levels	1 *(5.3%)*	- *(0%)*
College for technical courses	1 *(5.3%)*	2 *(10%)*
Apprenticeship	- *(0%)*	1 *(5%)*
College for handicapped individuals	2 *(10.5%)*	4 *(20%)*
No further education	13 *(68.4%)*	13 *(65%)*
TOTAL SUBJECTS	19	20

U = 186.5, z = -0.12, n.s. These results come from a Mann-Whitney analysis in which the 6 categories above were ranked from '0' to '5'.

Two members of the autism group went to university. At the time of follow-up, one was having to re-sit his second-year exams, but information obtained subsequent to the follow-up indicated that he did eventually obtain his degree. The other had, on graduating, progressed to doing an MSc. degree. Another of the autism group had failed to get his A'Levels at school and when followed-up was attending a college full-time to retake them. A fourth member of the group had gone to a technical college to do a foundation course in music, but had to abandon his wish to study music at a higher level as he did not have the necessary academic qualifications. None of the DLD subjects had taken either degree or A'Level courses but 2 had been to college on day-release to do technical courses. One of these had obtained an Advanced City and Guilds certificate in joinery, and the other had successfully completed a City and Guilds course in painting and decorating. A further member of the group spent six months doing an apprenticeship in the catering industry, but had to abandon this when he had a schizophreniform breakdown. The only other types of higher education

represented were courses run specially for handicapped individuals, involving mainly tuition in reading, writing and numerical skills. There were 2 members of the autism group and 4 members of the DLD group who took advantage of this provision. By far the majority of the subjects in both groups, however, had no further education and the Mann-Whitney U-test (with corrections for ties) based on the ranks '0' to '5' which correspond to the categories listed in Table 9.2, where '0' is 'university/polytechnic' and '5' is 'no further education', revealed no significant difference between the groups in terms of the levels of higher education they had received (*U = 186.5; z = -0.12, n.s.*).

EDUCATIONAL ATTAINMENTS

When educational attainments were investigated it was found that none of the DLD group had passed any formal examinations at school. Just over a quarter of the autism group, on the other hand, had passed at least one public examination and this difference between the groups was significant using the Mann-Whitney test (with corrections for ties) and ranks '0' to '3' where '0' was '5 or more O'level passes' and '3' was 'no exams passed' (*U = 130.0, z = -2.49, p = 0.01*). Table 9.3, below, summarises this information.

TABLE 9.3

PUBLIC EXAMINATIONS PASSED

	AUTISM		DLD	
5 or more O'Level passes	2	*(10.5%)*	-	*(0%)*
1-4 O'Level passes	2	*(10.5%)*	-	*(0%)*
CSE level only	1	*(5.3%)*	-	*(0%)*
No exams passed	14	*(73.7%)*	20	*(100%)*
TOTAL SUBJECTS	19		20	

U = 130.0, z = -2.49, p = 0.01. These results come from a Mann-Whitney analysis in which the 4 categories above were ranked from '0' to '3'.

Reading and spelling abilities were assessed when the subjects were seen at Time 3.

Reading accuracy was measured using the Gray Oral Reading Test; reading comprehension using the Edinburgh Reading Test, and spelling with the Schonell Spelling Test. One member of the DLD group was not available for testing. It would have been unsatisfactory to compute means on these results since for each of these tests there were at least some subjects who failed to reach the necessary basal age equivalents, and also because some scored at the ceiling level[1]. Two of the autism group failed to reach an age equivalent of 6 years on the Gray Oral Reading Test. Five of the autism group and 1 of the DLD group did not reach 7 years on the Edinburgh Reading Test, and there were 2 from the autism group who failed to achieve an age equivalent of 5 years on the Schonell Spelling Test. At the other end of the scale relatively few subjects scored at ceiling levels on any of the tests. There were 5 members of the autism group and 3 DLD subjects who achieved the ceiling age-equivalent of 17 years for reading accuracy; 2 individuals from the autism group and 1 DLD subject who scored at the ceiling level of 16 years for reading comprehension, and only

[1] It has already been seen on p. 97 that the ceiling scores may be an underestimate of actual abilities, at least in the area of reading attainment.

1 of the autism group subject reached the ceiling age equivalent of 15 years on the spelling test[2].

Because ot the difficulties presented by some subjects being below the basal level and others above the ceiling level, the median age equivalents for each of the groups and each of the tests were extracted and are presented in Table 9.4, below.

TABLE 9.4

MEDIAN AND THIRD QUARTILE AGE EQUIVALENTS FOR ATTAINMENT TEST RESULTS

	AUTISM (n=19)		DLD (n=19)	
Attainment Category	Median Age Equiv	3rd Quartile Age Equiv.	Median Age Equiv.	3rd Quartile Age Equiv
Reading accuracy	9y 3m	17y 1m	10y 0m	14y 6m
Reading comprehension	8y 7m	14y 9m	10y 3m	12y 10m
Spelling	10y 1m	14y 1m	9y 11m	10y 7m

For reading accuracy the median age equivalent was slightly higher in the DLD group (*10 years 0 months*) than it was in the autism group (*9 years 3 months*). The median age equivalents for reading comprehension showed a greater difference and again that of the DLD group was higher (*10 years 3 months*) than that of the autism group (*8 years 7 months*). There was little difference in the median age equivalents for spelling with that of the autism group marginally higher, at 10 years 1 month, than that of the DLD group at 9 years 11 months. An interesting set of findings emerged, however, when the spread of scores was examined more closely by calculating the third quartile age equivalent. The age equivalents for the autism group were almost 2 years or more higher on every test, revealing greater

[2]On p.98 it was seen that the method used for calculating the spelling age equivalent may have resulted in an underestimate. This effect however is likely to have been very slight indeed.

variability in the scores for this group, and more of them scoring in the higher ranges on these tests.

An alternative way of examining the attainment test results is to look at the numbers in each group who scored at an age equivalent below 10 years, and the results pertaining to each test are presented in Table 9.5.

TABLE 9.5

ATTAINMENT LEVELS FOR READING ACCURACY, READING COMPREHENSION AND SPELLING

	AUTISM	DLD		
	Age Equiv below 10 yrs	Age Equiv below 10 yrs	X^2	p
Reading accuracy	10 *(52.6%)*	8 *(42.1%)*	0.11	n.s.
Reading comprehension	11 *(57.9%)*	8 *(42.1%)*	0.42	n.s.
Spelling	9 *(47.4%)*	12 *(63.2%)*	0.42	n.s.
TOTAL SUBJECTS	19	19		

degrees of freedom = 1

It can be seen from the above table that there were no significant differences between the groups in the proportions of subjects who scored below 10 years in any of the three attainment domains. Many of the subjects who did very poorly in one area, did very poorly in the other areas too, so that 63.2% (*n = 12*) of the autism group had age equivalents below 10 years in at least one area, and 42.1% (*n = 8*) in all three. The corresponding percentages in the DLD group were 78.9% (*n = 15*) in one area, and 31.6% (*n = 6*) in all three.

The relationship between the scores on the two reading tests was examined next. Four of the autism group and 1 member of the DLD group did not reach the basal level on one or

both of the two reading tests and had to be excluded from this analysis. The autism group tended to have higher scores for reading accuracy than for reading comprehension and this difference just reached significance on the Wilcoxon test ($z = -1.92$; $p = 0.05$). The DLD group, on the other hand showed no predominant pattern of performance on the two reading tests ($z = 0.21$; *n.s.*).

Arithmetical abilities were also investigated and all subjects who were available for testing were given a written test of computational ability. The performances of the two groups on this non-standardised test were very similar with no significant differences between them (t=-0.45; *d.f.* = 36, *n.s.*). From a possible total of 17, the mean for the autism group was 11.3 (*S.D.* = 5.03), and for the DLD group it was 11.8 (*S.D.* = 2.59). A score of 11 on this test indicates that a subject has reached a level of competence where he can carry out simple single-digit multiplication sums (e.g. 7 x 4). Although there was little difference *between* the groups in terms of arithmetical ability, examination of the scale scores from the Arithmetic sub-test of the WAIS-R revealed that both groups were performing at levels considerably below normal. Fourteen (73.7%) members of the autism group and 13 (68.4%) from the DLD group had scale scores that were greater than one standard deviation below the mean.

In order to summarise these findings, a Composite Attainment Level was calculated for each subject by taking the mean age equivalent for reading comprehension, reading accuracy and spelling and then grouping this into one of three categories according to range. The numbers of subjects falling into each of these categories is shown in Table 9.6 below.

TABLE 9.6

COMPOSITE ATTAINMENT LEVELS

	AUTISM		DLD	
Composite Attainment Age Equivalent				
8 years 0 months and below	7	*(36.8%)*	4	*(21.1%)*
8 years 1 month to 12 years 0 months	5	*(26.3%)*	9	*(47.4%)*
12 years 1 month and above	7	*(36.8%)*	6	*(31.6%)*
TOTAL SUBJECTS	19		19	

U = 168.5, z = -0.37, n.s. These results come from a Mann-Whitney analysis in which the 3 categories above were ranked from '0' to '2'.

There was no significant difference between the groups in terms of distribution between the levels, using the Mann-Whitney test (with corrections for ties) and ranks of '0', '1' and '2' for the three categories listed in Table 9.6, where '0' was '8 years 0 months and below' and '2' was '12 years 1 month and above'.

SUMMARY

In general there was a tendency for the subjects in the autism group to remain in specialist education, whilst over half of the DLD group attended ordinary secondary schools. Four members of the autism group went on to higher education, but 2 of these were having difficulty in achieving the qualifications that they needed to carry on with further studies. Amongst the DLD individuals there were 2 who obtained a City and Guilds qualification, but none of the others had successfully completed any further education, nor had any passed any formal examinations. More of the autism group scored at ceiling levels on the reading

and spelling tests, but overall there was little difference between the groups on any of the tests of reading, spelling or arithmetical abilities, and both were substantially below what would be normal for their chronological ages. A history of school placements throughout childhood is presented in Appendix XIV.

CHAPTER TEN: INDEPENDENCE

The question of how independent the subjects were in adulthood was addressed by looking at: their living arrangements; data from informant reports, and their scores on the Daily Living Skills section of the Vineland schedule. In addition, the data relating to their understanding of concepts, and insight into their problems, are presented here, since deficits in these areas are likely to have a bearing on their ability to function independently.

LIVING ARRANGEMENTS

The most obvious and easily-observed measure of independent functioning was that which described the subjects' living arrangements. Table 10.1 lists the range of situations that were current at the time the subjects were seen.

TABLE 10.1

LIVING ARRANGEMENTS

	AUTISM	DLD
Independently away from parental home	2 *(10.5%)*	5 *(25%)*
Sheltered flat	1 *(5.3%)*	1 *(5%)*
Currently with parents but has lived independently in past	- *(0%)*	2 *(10%)*
Currently with parents - has never lived independently	6 *(31.6%)*	11 *(55%)*
Community with degree of autonomy	2 *(10.5%)*	1 *(5%)*
Residential unit for autistic adults	6 *(31.6%)*	- *(0%)*
Hostel for mentally-handicapped	1 *(5.3%)*	- *(0%)*
Long-stay hospital	1 *(5.3%)*	- *(0%)*
TOTAL SUBJECTS	19	20

It is clear from these data that the subjects were living in a variety of different situations, and that at least some in each group had achieved independence. Two members of the autism group were living entirely independently, having left home when they started university courses, and a third member of the group was living in a sheltered hostel attached to a workshop, where he enjoyed a high degree of independence. Amongst the DLD subjects there were a greater number who were living autonomously. Three had married and were living independently with their wives, another had left home to live with a girlfriend but when the relationship broke up he continued to live in their flat on his own, and a fifth subject was living alone in a house owned by a housing association with a special interest in disabled clients. A sixth member of the group was living in sheltered accommodation. He had suffered several schizophreniform episodes in the past and had been placed, by his local Social Services department, as a lodger with a family where he was given basic supervision in preparation for living totally independently.

All those subjects who were living independently or in sheltered accommodation, were asked whether they had any wish to return to the parental home and there were none who said that they did. This suggests that those who had achieved independence were coping successfully with the demands that it made upon them. The majority of this group had also organised their move to an independent home themselves, without any significant help in planning. One of the DLD subjects had been given some assistance by his parents, but did nonetheless play a prominent role in the decision-making. Both the subjects living in sheltered accommodation had been given advice and help in planning their moves. The age at which subjects left home to live independently or in sheltered accommodation tended to be older in the DLD group where the range was from 17 years to 25 years, with the median age being 23 years. The range in the autism group was from 18 years to 21 years with a median age of 19 years.

A considerable proportion of subjects were still living in the parental home. This was particularly true in the DLD group where 11 (*55%*) had never lived away from home. A further 2 (*10%*) had lived independently in the past but then for different reasons returned to live with their parents, one because his apprenticeship in another city ended, and the other because he took a job nearer to home. Taking both these groups into account it was therefore the case that 65% of the DLD group were still at the time of interview living with their parents. This was in spite of the fact that they were all young men in their twenties. The mean age of the 13 DLD subjects still living in the parental home was 24 years 5 months, and data from the 1981 Census (Roll, 1990) found that at the age of 24 years only 33% of males in the general population were still living in the parental home.

About a third of the autism group were living with their parents, but the greatest percentage (*53%, n = 10*) were living in residential accommodation. This ranged from 2 subjects who were living in a small group unit for autistic adults where they had some autonomy, to the 1 subject whose placement was in a long-stay mental handicap hospital. Six members of the group were living in large residential centres for autistic adults and a further subject lived in a

small group home catering for residents with a variety of mental handicaps. The median age of leaving home for residential accommodation was 15 years 6 months, but the actual ages ranged from 8 years to 19 years. Only 1 of the DLD group had any special residential provision made for him. This young man had, in common with the subject mentioned previously, experienced several schizophreniform episodes and was living in a hostel catering mainly for people with social disorders.

DAILY LIVING SKILLS

The Daily Living Skills section of the Vineland Adaptive Behaviour Scales provided data on independence levels. The mean standard scores of the two groups are given in Table 10.2, below, and it can be seen that on this measure the DLD subjects were found to be more independent than those in the autism group, a difference that was highly significant.

TABLE 10.2

DAILY LIVING SKILLS STANDARD SCORES

Source: *Vineland Adaptive Behaviour Scales*

	Mean Standard Score	*(S.D.)*
AUTISM (n =18)	65.1	*(35.0)*
DLD (n = 20)	99.2	*(15.0)*

t=3.83; d.f = 36, p = 0.001

As well as demonstrating that the DLD subjects were more independent overall and close to the mean for a "normal" group in the upper age-band of the Vineland standardization sample, it was possible to investigate how different aspects of independent functioning compared with the general population. There are three sub-sections within the category of Daily Living

Skills:- 'Personal' which covers how the individual eats, dresses and practices personal hygiene; 'Domestic' which is concerned with the household tasks that the individual performs, and 'Community' which provides information on how the individual uses time, money, the telephone and job skills. The data relating to these sub-sections and to the overall category of Daily Living Skills are summarised in Table 10.3 where they are presented in terms of the numbers and percentages within each diagnostic group who were functioning at levels defined in the Vineland Schedule as 'adequate' or better, for their age. The Schedule provides categorical measures of functional adequacy ranging from 'high' through 'moderately high', 'adequate', 'moderately low' to 'low' using tables selected according to the subject's chronological age.

TABLE 10.3

DAILY LIVING SKILLS - FUNCTIONAL ADEQUACY

Source: *Vineland Adaptive Behaviour Scales - Daily Living Skills Section*

	AUTISM (n=18)	DLD (n=20)			
Sub-section	Adequate	Adequate	U*	z*	p*
Personal	5 *(27.8%)*	16 *(80%)*	83.5	-3.19	0.001
Domestic	13 *(72.2%)*	19 *(95%)*	136.5	-2.01	<0.05
Community	7 *(38.9%)*	18 *(90%)*	89.0	-2.95	<0.005
Overall Daily Living Skills	7 *(38.9%)*	17 *(85%)*	95.5	-2.68	<0.01

**These data are the results of the Mann-Whitney analyses in which the scores on each variable were ranked from '0' to '4' as described in Appendix XV.*

Table 10.3 shows that whilst the majority of the DLD group were at least 'adequate' in all categories, only a minority of the autism group were functioning at this level in the 'Personal' and 'Community' sub-sections. Their abilities were strongest in the area of 'Domestic' skills where 72.2% were 'adequate', or better. The Mann-Whitney U-test (with corrections for ties)

was used and the ranks assigned were from '0' for 'high' to '4' for 'low'. It showed that the DLD subjects were functioning significantly better in all the Daily Living Skills sub-sections, and within the overall category of Daily Living Skills.

Other data relating to independent functioning were obtained from informant reports and are summarised in Table 10.4. There was no information for 1 member of the autism group. Subjects were classified as 'independent' within a category if they were able to perform that activity entirely independently; 'marginally independent' if they could perform the activity independently sometimes, but required help in certain situations, and as having 'little independence' if they were unable to carry out these activities independently, either at all, or the majority of the time.

TABLE 10.4

ASPECTS OF INDEPENDENT FUNCTIONING

Source: *Informant report*

I= Independent, M= Marginal Independence, L = Little Independence

	AUTISM (n=18)			DLD (n=20)					
	I	*M*	*L*	*I*	*M*	*L*	U*	z*	p*
Self-care	13	1	4	20	0	0	130.0	-2.49	<0.05
Use of telephone	7	1	10	17	2	1	84.5	-3.24	<0.005
Driving	3	0	15	7	4	9	106.5	-2-28	<0.05
Managing finances	5	0	13	14	5	1	70.0	-3.49	0.0005
Purchasing major items	4	1	13	16	4	0	62.0	-3.82	0.0001
Travel	7	0	11	16	3	1	87.0	-3.10	<0.005
Holidays	5	0	13	9	1	10	168.5	-0.37	n.s.

**These results come from Mann-Whitney analyses in which the individual scores for each variable were ranked as described in Appendix XV.*

It can be seen from Table 10.4 that the DLD group were more independent than the autism group in every respect. Ranks were given for each coding within each activity (see Appendix XV for details of these) and making use of these ranks the Mann-Whitney U-test (with corrections for ties) revealed significant differences between the groups in terms of 'self-care' which was mainly concerned with the ability to take care of personal hygiene; 'independent use of the telephone'; 'driving'; 'managing finances;, 'independent travel', and 'being able to purchase major items'.

Using these informant-based data a composite independence score was calculated for each subject. This was based on their abilities to carry out self-care activities, to travel independently and to manage their finances. These three items were chosen because they appeared to allow a good estimate of independent functioning in a broad range of situations, and because the abilities of the subjects on these measures showed considerable variance. The subjects were then categorised into 3 levels of functioning according to their overall abilities on this measure, which was termed the 'Composite Independence Level. In Table 10.5, below, there is a summary showing the numbers and percentages of subjects in each category. It is clear that the autism group were considerably less independent on this measure too, and this was confirmed using the Mann-Whitney U-test (with corrections for ties), where the analysis was based on the ranks '0', '1' and '2', for 'fully independent', 'moderately independent' and 'little independence'. Nonetheless, it is noteworthy that over a third of the DLD group were rated as being less than fully independent.

TABLE 10.5

COMPOSITE INDEPENDENCE LEVELS

	AUTISM		DLD	
Fully independent	5	*(27.8%)*	13	*(65%)*
Moderately independent	0	*(0%)*	5	*(25%)*
Little independence	13	*(72.2%)*	2	*(10%)*
TOTAL SUBJECTS	18		20	

U=80.5, z = -3.19, p<0.001. These results come from a Mann-Whitney analysis in which the 3 categories above were ranked from '0' to '2'.

UNDERSTANDING OF CONCEPTS AND INSIGHT INTO PROBLEMS

Because a high proportion of the autism group were unable to cope with direct questioning there is little information that came directly from the subjects themselves. Information covering the subjects' levels of insight and understanding of various concepts came mainly from informant reports, although in the cases of 'marriage' and 'friendship' the subjects were asked directly during the course of the ADOS assessment. Table 10.6 provides a summary of the findings under this heading. There were reduced numbers in all categories, and this arose for several reasons. For 1 of the autism group there was no informant information, and in addition a number of informants in each group felt that they knew very little about the subjects' concepts and this had to be coded as missing information.

[illegible] numbers in this

[illegible]egory.

TABLE 10.6

NAIVETY

Sources: *(a) Informant report (b) Subject report*

M = 'Marginal', D = 'Definite'

	AUTISM			DLD				
	n	*M*	*D*	*n*	*M*	*D*	U*	p*
Subject has naive concept of								
Marriage (b)	*13*	3	7	*18*	1	2	42.0	<0.001
Friendship (b)	*13*	3	7	*18*	5	2	53.0	<0.01
Career plans (a)	*17*	-	13	*19*	5	3	60.5	<0.01.
Why others get annoyed with him (a)	*17*	4	3	*19*	3	1	121.5	n.s.
Planning for the future (a)	*18*	-	13	*18*	10	3	88.5	<0.05

**These results come from Mann-Whitney analyses in which the individual scores for each variable were ranked as described in Appendix XV.*

Details of the ranks used in the Mann-Whitney U-test are provided in Appendix XV. It can be seen in the table above that for each concept there was at least 1 member from each group whose understanding was definitely naive, and usually some others who had a reduced understanding. There were in all cases, more of the autism group who had difficulties in understanding, although the groups did not differ significantly in understanding why others got annoyed with them. The autism group were significantly poorer, however, at understanding the concept of friendship and in understanding the need to plan realistically for the future. Although the autism group were poorer in these respects, it is noteworthy, nonetheless that there were at least some DLD subjects in each category who had a naive

understanding, or who lacked the insight to fully appreciate the significance of certain situations.

SUMMARY

There were clear differences between the groups in terms of the levels of independence they had achieved. The DLD group were considerably more independent in areas such as self-care, use of the telephone, driving, managing finances, travel and purchasing major items, and the majority were rated as being 'adequate' for their age on a range of activities, whereas this was the case for only a minority of the autism group. Nonetheless, despite the greater independence of the DLD group there was still a substantial minority of over a third who were less than fully independent. It was also noteworthy that so many members of the group were still living in the parental home. Likewise, with regard to naivety it appeared that there were DLD subjects whose understanding of certain situations and/or concepts was limited, although they appeared to have fewer problems in this area than the autism group.

CHAPTER ELEVEN: EMPLOYMENT EXPERIENCE

This chapter on employment experience covers: the types of employment subjects were in; the stability of their work records, and any problems they had encountered in their working lives or at their day centres.

TYPES OF EMPLOYMENT

Table 11.1, below, details the types of employment that subjects had, and a full list of actual occupations is given in Appendix XIV.

TABLE 11.1

TYPE OF EMPLOYMENT

	AUTISM		DLD	
Independent regular job	1	*(5.3%)*	12	*(60%)*
Regular job under special arrangements	2	*(10.5%)*	1	*(5%)*
Voluntary work only	1	*(5.3%)*	1	*(5%)*
Attends day centre or in residential placement	12	*(63.1%)*	2	*(10%)*
No occupation or placement	1	*(5.3%)*	4	*(20%)*
Still in full-time education	2	*(10.5%)*	-	*(0%)*
TOTAL SUBJECTS	19		20	

$U = 97.5$, $z = -2.72$, $p < 0.01$. These results come from a Mann-Whitney analysis in which the first 5 categories above were ranked from '0' to '4'. The 2 individuals in full-time education were not included in this analysis.

Only 1 member of the autism group had an independent regular job and he was employed as a laboratory technician. Over half the DLD group, on the other hand, were working independently in a variety of occupations that were, in general, either manual or unskilled

work. Two members of the autism group had regular jobs, but worked under special arrangements. One was on the Disabled Person's Register and read newspapers for the blind, and the other was employed in a workshop similar to a Remploy factory, where he did industrial contract work at a commercial rate. Likewise, there was 1 DLD subject who had what was, in effect, a sheltered job in a factory belonging to a family friend. Amongst the subjects who had no regular jobs there was 1 individual in each group who had a regular commitment each week to do voluntary work. The majority of the autism group, however, were either attending day centres or were in residential placements with an integral daytime program, and there were also 2 individuals in the DLD group who were attending day centres catering for clients with a range of learning disorders. 20% ($n = 4$) of the DLD group were unemployed and 1 member of the autism group lived with his family in a remote rural community where he had no employment or placement of any sort. Two of the autism group were still in full-time education and were excluded from the following analysis. The Mann-Whitney U-test, (with corrections for ties), and using the ranks '0' to '4' for the categories in Table 11.1 where '0' was 'independent regular job' and '4' was 'no occupation or placement', showed that the DLD group had significantly higher levels of employment than the autism group ($U=97.5$, $z=-2.72$, $p<0.01$).

All those subjects who had independent regular jobs were considered to be in employment that was appropriate to their level of education and skills. It has already been seen in the sections on higher education and examinations passed that 2 of the DLD subjects had obtained City and Guilds Certificates, but no other members of this group had obtained any public examination passes or qualifications. Both the individuals with qualifications were in regular full-time employment and making appropriate use of their training. The only member of the autism group to be in regular independent employment was studying for an MSc. degree and working as a laboratory assistant, a job that was considered to be appropriate for his level of education and circumstances. One of the other 3 autistic subjects who had O'Level passes had completed a foundation course in music but had been unable to achieve the necessary academic qualifications in order to study the subject at a higher level. It is

debatable exactly what his qualifications and experience would best suit him to do, but he had been unable to get an independent regular job and was on the Disabled Persons Register, reading newspapers for the blind. The remaining 2 members of the group who had O'Level passes were both in full-time education,. One was retaking second-year undergraduate exams that he did subsequently pass, and the other was re-taking A'Levels.

Of those individuals in independent regular work, the majority had found their jobs without help. The member of the autism group with an independent regular job had found this on his own, as had 8 of the DLD group. Four had, however, been given some assistance by their families or by careers officers, although all of them had been required to use *some* initiative themselves in obtaining their work.

EMPLOYMENT HISTORY

Table 11.2, overleaf, provides information about the numbers of jobs that the subjects had held.

TABLE 11.2

HISTORY OF JOB CHANGES

Source: Informant Report

	AUTISM	DLD
Almost continually in paid employment since beginning work	2 *(10.5%)*	7 *(35%)*
Some prolonged periods of employment but also long periods out of work or in temporary jobs	1 *(5.3%)*	6 *(30%)*
No prolonged period of employment, brief temporary jobs only	- *(0%)*	5 *(25%)*
No paid employment ever	14 *(73.7%)*	2 *(10%)*
Still in further education	2 *(10.5%)*	- *(0%)*
TOTAL SUBJECTS	19	20

It can be seen that the vast majority of the autism group had never had any paid employment. Of the 3 who had, 2 had very stable work records and the other had experienced some prolonged periods of employment, although he had also had some long periods of time out of work. The employment histories of the DLD group showed that 90% had been in paid employment at some time and that of those who had been employed 38.9% had stable work records. Nonetheless, this still left 33.3% of those who had been employed who despite having some prolonged periods of employment had also had long periods out of work or in temporary jobs, and a further 27.8% who had only ever had brief temporary jobs.

PROBLEMS IN THE WORK-PLACE OR DAY CENTRE

A number of subjects had experienced problems at work or in their day programs, and a summary of this information is presented in Table 11.3. This reveals that approximately a third of each group were experiencing some problems in their work or at their centres, and that in some cases these were serious enough to affect the individual's ability to hold down a job or retain their place at a day centre. Overall, there were no significant differences between the groups in terms of the severity of problems they had experienced at work, or in their day programs. The Mann-Whitney U-test (with corrections for ties) was used to analyse these data. The subject who had not ever had a job or centre placement and the one with missing information were removed from the analysis. Ranks were assigned to the remaining categories in Table 11.3 so that "no problems' was ranked '0' and 'major problems leading to disciplinary procedure or dismissal' was '4', (*U = 161.5; z = -0.31, n.s.*).

Two of the autism group and 3 members of the DLD group had experienced major problems that led to disciplinary procedures, and in most cases to dismissal. One of the autistic subjects in this category had thrown boiling water over another resident at his centre, and was subsequently asked to leave, whilst another had become disturbed and had on several occasions thrown chairs through windows and grabbed people. He had, at the time of contact, been suspended from his day centre whilst his situation was reviewed.

TABLE 11.3

PROBLEMS AT WORK OR DAY CENTRE

	AUTISM		DLD	
No problems	11	*(57.9%)*	13	*(65%)*
Minor problems that cause irritation to workmates	3	*(15.8%)*	1	*(5%)*
Substantial problems with more than occasional complaints	1	*(5.3%)*	1	*(5%)*
Major problems leading to subject's own decision to leave	-	*(0%)*	2	*(10%)*
Major problems leading to disciplinary procedure or dismissal	2	*(10.5%)*	3	*(15%)*
No job/centre ever	1.	*(5.3%)*	-	*(0%)*
Not known	1	*(5.3%)*	-	*(0%)*
TOTAL SUBJECTS	19		20	

U = 161.5, z = -0.31, n.s. These results come from a Mann-Whitney analysis in which the first 5 categories above were ranked from '0' to '4'. The last 2 categories were not included in the analysis.

Amongst the DLD individuals, one had deliberately set fire to some paper in an outbuilding of the factory where he was working and was consequently dismissed. Another had caused distress to a young female colleague when he questioned her about sex. He did not fully understand why she was so upset, and his intentions were almost certainly innocent, but he was nonetheless asked to leave his job as a result of this incident. One other member of the group was asked to leave because he could not work fast enough. A further 2 DLD subjects experienced major difficulties in getting on with colleagues and both decided to leave their jobs because of this. One found it hard to accept orders from his supervisor and the other was cruelly teased. There was in addition 1 member of each group who had substantial problems, but these were tolerated, although there were more than occasional complaints. The autistic subject, who was placed in a residential setting, was said to be obstructive and unco-operative, and often screamed and took food from other people's plates. The DLD

subject in this category had suffered a schizophreniform breakdown and believed that he was being persecuted.

There were also 3 autistic subjects and 1 member of the DLD group who had minor problems, such as constant talking, that caused irritation to their colleagues but which were in general tolerated.

SUMMARY

Over half the DLD group were working independently This was true for only 1 member of the autism group, however, with the majority of subjects in this group attending day centres or in residential placements. Although the majority of the DLD individuals were in paid employment, about two-thirds of these had irregular work records with either long periods out of work or in a series of temporary jobs. About a third of the subjects in each group had experienced problems at work or in their day programs, and in some cases these were serious enough to affect their ability to hold down a job or retain a place at a day centre.

CHAPTER TWELVE: BEHAVIOURAL FUNCTIONING

This chapter covers the types of repetitive and stereotyped behaviours commonly found in autism, as well as giving consideration to other maladaptive behaviours, that are not necessarily associated with autism.

AUTISTIC-TYPE QUASI-OBSESSIVE BEHAVIOURS

Information concerning the types of behaviours that are typically associated with autism was collected through informant reports, and some of these behaviours were also rated as part of the Autism Diagnostic Observation Schedule. Table 12.1, overleaf, summarises the findings. Complete information was available from informant reports for all the DLD group, and all but one of the autism group, but for the observational material there was 1 subject in each group for whom there was no information. Full details of the codings used in collecting the information and the ranks assigned in the Mann-Whitney U-tests are provided in Appendix XVII.

It can be seen from the results overleaf that the autism group were reported to have significantly more of certain of the stereotyped behaviour patterns that are often associated with autism, namely: unusual preoccupations; compulsions/rituals; resistance to change; unusual sensory interest and verbal rituals. They did not differ with respect to the incidence of unusual attachment to objects, for which there was a very low incidence of positive reports. Many children show these attachments but they appear to be uncommon in more able adults with autism (Howlin, personal communication). The autism group also showed more motor abnormalities such as hand and finger mannerisms, other mannerisms and stereotyped movements, and oddity of gait. Standardised observation of the subjects confirmed the presence of certain behaviours in some individuals, but the numbers were smaller than would be expected from the informant reports and consequently no significant

differences were found between the groups on any of the observed behaviours. This reduced incidence was probably influenced by the relatively short 20-minute observation period and the type of situation in which the subjects were rated, which although only semi-structured was still somewhat removed from a wholly naturalistic observation. It should also be noted that this finding is in keeping with expectations based on previous use of the instrument when Lord et al. (1989) found that restricted and stereotypic behaviours and interests were observed in only 7 out of 20 autistic subjects, even though all of these were reported as showing such behaviours in other contexts. The clearest finding, however, was that with the exception of 'unusual preoccupations', all the cases of definite behaviours were in the autism group.

The definite behaviours that were found in the DLD group applied to 2 members who were reported to have unusual preoccupations that were strong enough to account for almost all their free time and intruded on family life to some extent. One of these was preoccupied with buses, spending all his available time at the local bus station and any spare money he had on lengthy bus journeys. The other kept racing pigeons and spent every evening and weekend with them, to the extent that he had very little time for anything else.

TABLE 12.1

BEHAVIOURS TYPICALLY ASSOCIATED WITH AUTISM

Sources: (a) Informant report (b) Direct observation on ADOS

N='No abnormality', M = 'Marginal', D = 'Definite abnormality'

	AUTISM			DLD					
	N	*M*	*D*	*N*	*M*	*D*	U*	z*	p*
(i) Stereotyped behaviour patterns									
Unusual preoccupations									
(a)	5	7	6	13	5	2	104.0	-2.40	<0.05
(b)	15	1	2	17	2	-	158.5	-0.64	n.s.
Compulsions/rituals									
(a)	6	6	6	15	5	-	90.0	-2.93	<0.005
(b)	15	1	2	19	-	-	142.5	-1.83	n.s.
Resistance to change									
(a)	*9*	*7*	*2*	*16*	*4*	-	122.0	-2.04	<0.05
Unusual sensory interest									
(a)	*11*	*1*	*6*	*20*	-	-	110.0	-3.04	<0.005
(b)	*17*	-	*1*	*19*	-	-	161.5	-1.03	n.s.
Verbal rituals									
(a)	*13*	*4*	*1*	*20*	-	-	120.0	-2.77	0.01
Unusual attachment to objects									
(a)	*16*	*2*	-	*19*	*1*	-	169.0	-0.69	n.s.
(ii) Motor abnormalities									
Hand and finger mannerisms									
(a)	*11*	*4*	*3*	*20*	-	-	110.0	-3.03	<0.005
Other mannerisms or stereotyped movements									
(a)	*12*	*1*	*5*	*20*	-	-	120.0	-2.77	<0.01
Oddity of gait									
(a)	*7*	*9*	*2*	*20*	-	-	70.0	-4.06	<0.001
TOTAL SUBJECTS									
(a)	18			20					
(b)	18			19					

**These results come from Mann-Whitney analyses in which the individual scores for each variable were ranked as described in Appendix XVII.*

A further 5 fell into the 'marginal' category with interests that occupied an unusual amount of time, but not to the extent of interfering with other activities. There were 6 individuals in the autism group who had special interests that preoccupied them to the exclusion of other activities and were strong enough to intrude on family life (e.g. watching horror movies, collecting facts about the Royal Family, doing the family shopping). A further 7 autistic subjects had special interests that were of an unusual degree, but these were not intrusive and this group is referred to in Table 12.1 as 'marginal'.

Although there were no other reports of any DLD individuals showing definite instances of any of the behaviours listed overleaf, there were several who fell into the 'marginal' category. Five, for example were said to be 'unusually routinised', although none showed any definite compulsions or rituals. The main other category in which this group featured was 'resistance to change' where 4 individuals showed 'unusually negative reactions to change', so that they had a strong preference for routines and plans to stay as expected, but they could nonetheless cope with changes, without marked distress and without interference in family life.

In order to compare the behavioural functioning of the two groups more comprehensively, a Behaviour Composite Score was derived using the informant ratings for 'unusual preoccupations:, 'rituals/compulsions'; 'resistance to change', and 'unusual attachments to objects'. The total score obtained by adding all these ratings together was then sub-divided into three levels of 'autistic-type behaviour disorder' (0,1 ='none/minimal'; 2-5 = 'moderate'; 6 and above = 'severe'), and a summary of this is provided in Table 12.2. Overall, the autism group had significantly more autistic-type behaviours ($U = 102.5$, $z = -2.53$, $p = 0.01$), using the Mann-Whitney U-test (with corrections for ties) for the analysis, with the ranks '0', '1' and '2' for the levels of behaviour disorder listed in Table 12.2. Nonetheless, it was noteworthy that over a third of the DLD group were rated as having moderate levels of behaviour disorder.

TABLE 12.2

COMPOSITE BEHAVIOUR SCORES (FOR 'AUTISTIC-TYPE' BEHAVIOURS)

	AUTISM	DLD
Level of 'Behaviour disorder'		
None/minimal	5 *(27.8%)*	13 *(65%)*
Moderate	10 *(55.6%)*	7 *(35%)*
Severe	3 *(16.7%)*	- *(0%)*
TOTAL SUBJECTS	18	20

u = 102.5, z = -2.53, p = 0.01. These results come from a Mann-Whitney analysis in which the categories above were ranked from '0' to '2'.

GENERAL MALADAPTIVE BEHAVIOURS

Information on more general maladaptive behaviours was provided by the informant-based Maladaptive Behaviours Scale of the Vineland Adaptive Behaviour Scales. A complete list of the behaviours covered is included in Appendix XVIII, and these ranged from bed-wetting and sleep disturbances to stealing and aggression. The raw scores obtained on this scale were converted to a categorical measure signifying the overall severity of the score (either 'non-significant', 'intermediate' or 'significant'), in accordance with the procedure in the test manual. The results are presented below in Table 12.3.

TABLE 12.3

GENERAL MALADAPTIVE BEHAVIOURS

Source: *Vineland Maladaptive Behaviour Scales*

	AUTISM	DLD
Severity of Maladaptive Behaviour		
Non-significant	6 *(33.3%)*	6 *(30%)*
Intermediate	4 *(22.2%)*	11 *(55%)*
Significant	8 *(44.5%)*	3 *(15%)*
TOTAL SUBJECTS	18	20

U = 148, z = -0.99, n.s. These results come from a Mann-Whitney analysis in which the categories above were ranked from '0' to '2'.

Table 12.3 shows that at least two-thirds of the subjects in each group showed 'intermediate' or 'significant' problems. There was no significant difference between the two diagnostic groups when their levels of general maladaptive behaviours were compared (*U = 148, z=-0.99, n.s.*), on the Mann-Whitney U-test (with corrections for ties) using the ranks '0', '1' and '2' for 'non-significant', 'intermediate' and 'significant' respectively.

More detailed information on levels of aggression was available as a result of the informant interviews, and this is detailed in Table 12.4. This provides separate information on the subjects' levels of aggressive behaviour when they were in the home or family situation, and when they were outside the home environment. Each subject is only represented once in each of the two columns, as the table summarises information on the most extreme category of aggressive behaviour over the 3 years prior to the interview, rather than detailing all instances. This shows that the majority of the individuals in each group had an appropriate level of control when they were angered and both groups had a slightly better level of control outside the home environment than within it. One of the DLD group had used physical force against a family member on more than one occasion, but there were no other cases of

aggression worse than shouting or swearing amongst this diagnostic group. In the autism group there were 5 individuals who had shown aggressive behaviour to people or objects on more than one occasion. Overall there were no significant differences between the groups either in the home situation (*U = 131.0; z = -1.13, n.s.*) or outside it (*U = 152.5; z = -1.13, n.s.*). The ranks used in the Mann-Whitney U-test (with corrections for ties) were those in Table 12.4, where '0' was 'appropriate level of control' and '4' was 'has hurt people in anger on more than one occasion'.

TABLE 12.4

DISPLAYS OF AGGRESSION (PAST THREE YEARS)

Source: Informant Interview

	AUTISM		DLD	
	At Home	Outside	At Home	Outside
Appropriate level of control	11 *(57.9%)*	13 *(68.4%)*	15 *(75%)*	17 *(85%)*
Has shouted or sworn in anger on more than one occasion	1 *(5.3%)*	2 *(10.5%)*	4 *(20%)*	3 *(15%)*
Has broken objects in anger on more than one occasion	2 *(10.5%)*	1 *(5.3%)*	- *(0%)*	- *(0%)*
Has used physical force against people on more than one occasion	2 *(10.5%)*	- *(0%)*	1 *(5%)*	- *(0%)*
Has hurt people in anger on more than one occasion	1 *(5.3%)*	2 *(10.5%)*	- *(0%)*	- *(0%)*
Not known	2 *(10.5%)*	1 *(5.3%)*	*(0%)*	- *(0%)*
TOTAL SUBJECTS	19	19	20	20

SUMMARY

Although the autism group showed significantly more quasi-obsessive behaviours than the DLD group, there was some evidence of such behaviours in a minority of the latter group.

There were similar levels of *non-autistic* type maladaptive behaviours in the two groups with the minority being rated as having "non-significant" problems.

CHAPTER THIRTEEN: NON-AUTISTIC PSYCHIATRIC SYMPTOMATOLOGY

Data on non-autistic psychiatric symptomatology during the period since middle childhood were gathered from informants. Several individuals in each group had required psychiatric intervention and a summary of this information is given in Table 13.1.

TABLE 13.1

PSYCHIATRIC INTERVENTIONS SINCE MIDDLE CHILDHOOD

	AUTISM	DLD
In-patient psychiatric treatment	1	1
Out-patient psychiatric treatment, without admission, for problems not directly associated with autism or language disorder	1	1
Neuroleptic drugs prescribed for behavioural problems	3	-

IN-PATIENT PSYCHIATRIC TREATMENT

One member of each group had received in-patient psychiatric treatment. In the case of the subject with autism, (A2, in the vignettes in Appendix VII), this was for a sudden and unexplained onset of catatonia. At the age of 15 he slowed down, and became enuretic on return from boarding school for the holidays. He was usually described as being 'cheerful' , but during this time he was quite unlike his normal self. He did not react to anything, said nothing, had no appetite and was completely withdrawn, with no energy. After 3 weeks at home he had improved gradually until he was back to his normal state and returned to school for the new term. By half-term, however, he had deteriorated again, and all the previous signs had returned, but more severely. He did nothing at all and if feeding himself, for example, would hold the spoon half-way between the plate and his mouth for a quarter of an

hour without moving. He was admitted to an adolescent psychiatric unit and improved very rapidly, returning to his prior level of functioning and resuming school, with no further recurrence.

The DLD individual, (DLD50 in Appendix VII) who required in-patient care had suffered a schizophreniform illness. He became withdrawn and quiet at the age of 19 years and suffered from hallucinations and delusions. He was hospitalised for 4 months and made a good recovery. After his illness he was reported to have had improved social functioning and insight into his problems, although he still found it difficult to make real friends and tended to attract people who then took advantage of him by, for example, borrowing money and not paying it back. At the time of the current research he was experiencing another episode of illness and was back in hospital with delusions and hallucinations.

OUT-PATIENT PSYCHIATRIC TREATMENT AND DRUG TREATMENT

A further member of each group had required out-patient psychiatric treatment that had not resulted in admission. The autistic individual (A14) had, in his early twenties, shown a marked increase in behavioural problems and displayed severely disruptive behaviour, usually in relation to some frustration or interruption of his obsessive routines or preoccupations. There was also an unconfirmed suspicion that he was suffering from a depressive disorder. He lived at home with his parents and attended a day centre. At the time of contact he had been suspended whilst his case was reviewed. The DLD individual (DLD56) had, in common with the case described above, experienced a schizophreniform disorder with delusions. He had received out-patient treatment, but had to leave his job as a trolley-collector at a supermarket, because of his paranoid fears. At the time of interview he was living in sheltered accommodation and attending a day centre for mixed mental handicap. The 2 DLD subjects had both received neuroleptic drugs, as had the autistic subject with disruptive behaviour. In addition a further 3 members of the autism group, (A5,

A9 and A16), had been prescribed drugs within this category, for general disturbances of behaviour.

SUMMARY

There were several examples in each group of individuals requiring psychiatric intervention.

The finding that some forms of language delay carry an increased risk for schizophrenia developing in late adolescence or early adulthood has already been discussed . The discovery that 2 members of the DLD group had suffered from schizophreniform illnesses is therefore of interest and importance and will be considered further in Section C.

CHAPTER FOURTEEN: OTHER SOCIAL DEFICITS

This chapter presents data in two additional areas that together provide further information about patterns of social deficits in the two groups of subjects. The first set of data comes from the socio-emotional tasks described in Chapter Four, and the second is a report of a pragmatic analysis undertaken by Eales (1993). The data used in the latter analysis were gathered by the current author, but acknowledgements are due to Eales (ME) in reporting the findings from his analysis. These data are presented here since they provide additional and valuable information about patterns of functioning within the current group of subjects.

SOCIO-EMOTIONAL TASKS

THE SUBJECTS

The data presented here come from a sub-set of the total pool of subjects. Some individuals, mainly from the autism group, were unable to cope with the demands of one or other of the tasks, and in a few other cases it was not possible to complete the tasks, either for technical reasons, or because the subject was unwilling to do so. Consequently the total number of subjects for whom there were complete data on these tasks was 7 in the autism group, and 13 in the DLD group.

The verbal abilities of these two groups appeared very similar on both the PPVT (*mean standard score = 65.1 vs 65.0; S.D.'s = 22.4 vs 16.3 for the autism vs. DLD group; t = 0.02; d.f. = 18; p = n.s.*), and on the Verbal Scale of the WAIS (*mean verbal IQ = 79.6 vs. 75.0; S.D.'s = 7.2 vs. 5.2; t = 1.6; d.f. = 18; p = n.s.*). The autism group had a higher mean score on the WAIS Performance Scale, however (*mean Performance IQ = 87.6 vs. 78.1; S.D.'s = 8.6 vs. 9.6; t = 2.2; d.f. = 18; p,0.05*).

JUDGES

There were 3 judges, and each rated all of the photographs and tapes. There were 20 subjects, each with 15 photographs and 15 tape-recorded utterances. This gave a maximum possible score (of intended emotions identified correctly) of 300 per judge in each modality. All judges scored above chance expectancy, and were similar in the total number of intended emotions identified correctly (*55.3%; 51.6%; 52.3%* for the photographs, and *52.6%; 56.0%; 54.0%* for the tapes). Agreement amongst the judges was investigated in more detail by comparing the number of correct responses to each of the 20 subjects. A Kendall coefficient of concordance (Siegel, 1956) yielded a W of 0.78 ($p < 0.001$) for accuracy on the facial expression tasks and a W of 0.84 ($p < 0.001$) for accuracy on the vocal expression task.

RESULTS

Facial recognition task

The groups were very similar in their performances on both aspects of this task, i.e. matching emotional faces to the situation, and naming the emotion. The maximum score for each part of the task was 20, and only 2 subjects, both from the autism group achieved this on both sub-tasks. A summary of the findings are given in Table 14.1, overleaf and show that there were no significant differences between the groups.

TABLE 14.1

FACIAL RECOGNITION TASKS

	AUTISM (n=7)		*DLD (n=13)*				
	Mean	*(S.D.)*	Mean	*(S.D.)*	t	d.f.	p
Selecting correct photograph	15.4	*(4.5)*	15.5	*(2.7)*	-0.02	18	n.s.
Naming emotion correctly	17.0	*(3.3)*	17.2	*(1.7)*	-0.14	18	n.s.

Vocal recognition task

The autism group were significantly better at identifying the intended emotion in the first block of speech, which was the unfiltered one (*t = 3.41; d.f. = 18; p<0.005*). The maximum score for this block was 18. For the filtered speech blocks, where the maximum score for the two blocks combined was 36, the autism group again had a higher mean rate of success in identifying the correct emotion (*25.9; S.D. = 7.7 vs. 20.1; S.D. = 7.0 in the DLD group*), but the difference between the groups on these filtered blocks was not significant (*t = 1.71; d.f. = 18; p =n.s.*). The results are summarised below in Table 14.2.

TABLE 14.2

VOCAL RECOGNITION TASKS

	AUTISM (n=7)		*DLD (n=13)*				
	Mean	*(S.D.)*	Mean	*(S.D.)*	t	d.f.	p
Unfiltered speech (max = 18)	14.6	*(2.8)*	9.8	*(3.0)*	3.41	18	<0.005
Filtered speech (max = 36)	25.9	*(7.7)*	20.1	*(7.0)*	1.71	18	n.s.

Macdonald et al. (1989) reported that normal subjects found the filtered emotional speech more difficult to categorise than comprehensible speech, whereas the group with autism showed no significant difference between the two speech situations. In the current study there was no significant difference in the percentages of scores correctly identified on the unfiltered and filtered tasks for either the autism group (*t = 0.48; d.f. = 6; n.s.*) or the DLD group (*t = 0.20; d.f. = 12; n.s.*). Two (*28.6%*) members of the autism group achieved their highest scores on the filtered speech blocks and in the DLD group over half (*n = 7; 53.8%*) did so.

Facial expression task

The judged correct responses (i.e. responses that matched the intended emotion) were summed such that each subject could receive a maximum possible score of 45[1]. The mean number of correct identifications in the autism group was higher (*X = 29.7; S.D. = 10.8 vs 20.8; S.D. = 4.9 in the DLD group*) and this difference was found to be significant (*t = 2.5; d.f. = 18; p< 0.05*).

Taking the oddity scores next, these were summed across judges to obtain a total oddity score for each subject. Judges were not given detailed instructions on how to rate 'oddity' since the intention was to obtain a subjective measure of deviation from normal facial expression. Subjects were likely to attract ratings of 'odd' or 'very odd', however, if these facial expressions were, for example, stilted, mechanical or blank. The range of scores for each photograph was from '0' for 'not at all odd' to '2' for 'very odd'. With a total of 15 photographs and 3 judges this gave a maximum possible oddity score of 90 for each subject. The results are summarised in Table 14.3, overleaf.

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[1] i.e. 15 photographs rated by 3 judges.

TABLE 14.3

ODDITY SCORES ON FACIAL EXPRESSION TASK

	AUTISM (n=7)		*DLD (n=13)*				
	Mean	(S.D.)	Mean	(S.D.)	t	d.f.	p
Total oddity score	25.4	(14.6)	20.6	(10.5)	0.85	18	0.405

The autism group were rated as generally more odd, with a higher mean score than in the DLD group, but the difference was not found to be significant.

Vocal Expression

Once again the maximum possible score of judged correct responses was 45. As with facial expression the autism group did better, with a mean number of correct identifications of *30.9; S.D. = 9.6*. In the DLD group the mean was *20.7; S.D. = 9.1*. This difference was significant (*t = 2.3; d.f. = 18; p<0.05*).

Here too, the judges rated 'oddity' as a subjective measure of deviation from normality. As with the facial expression oddity scores they were not given detailed instructions on what constituted 'odd', but the types of voice that were likely to attract such a rating were those that sounded mechanical, stilted or markedly lacking in emotion. Once again it was the autism group who were rated as being more odd. This time, however, the difference between the groups did reach significance (*t = 2.6; d.f. = 18; p = 0.02*). The results are summarised in Table 14.4.

TABLE 14.4

ODDITY SCORES ON VOCAL EXPRESSION TASK

	AUTISM (n=7)		*DLD (n=13)*				
	Mean	*(S.D.)*	Mean	*(S.D.)*	t	d.f.	p
Total oddity score	27.4	*(14.5)*	12.6	*(10.7)*	2.6	18	0.02

Socio-Emotional Composite score

In an attempt to summarise these findings a Socio-Emotional Composite score was calculated, based on the method described in Macdonald et al. (1989). It represented the mean percentage accuracy across 4 tasks (matching photos, unfiltered speech block, facial expression and vocal expression). A cut-off point of 1 standard deviation below the mean for the normal group in Macdonald et al.'s research (*X = 78.87; S.D. = 5.68*) was used to classify the subjects into two groups. Four members of the autism group (*57.1%*), were above this cut-off, and only 1 of the DLD group (*7.7%*) performed sufficiently well to be above it. Nonetheless, the difference in percentages of subjects falling above and below the cut-off fell just short of the 5% level of significance (*Fisher exact probability test two-tailed, p = 0.058*).

It is clear that both groups were showing impairments on these tasks. The autism group had higher scores than the DLD group in a number of areas, but it should be remembered in interpreting these findings that 9 members of the autism group were not testable on these tasks. This also applied to 1 member of the DLD group. It seems reasonable to estimate that all of the 'untestable' subjects would be below the composite score cut-off point if results were available, and when these results were taken into account the autism group were seen

to be doing more poorly overall than the previous findings suggested. If the 9 untestable members of the autism group are added to the 7 for whom results were obtained then this gives a total of 16 subjects with either measured or estimated scores. Hence the 4 who were above the cut-off point constituted 25% of the total group for whom scores were obtained or estimated, and following the same method, the 1 DLD subject was 7.1% of the DLD group. It would be expected in a normal distribution that 65.9% of the group would fall above the cut-off point[2].

These are somewhat artificial tasks, and so far it is uncertain how far they really do reflect social functioning. Nonetheless it is clear that they do provide a measure of some aspect of behaviour on which both groups are considerably impaired.

PRAGMATIC ANALYSIS

METHOD

Audiotaped samples of conversation made from the ADOS video recordings were transcribed and analysed using a pilot version of methods developed by Bishop and Adams (1989) in their study of semantic-pragmatic language disorders in children. These methods yield frequency counts for a variety of conversational features including aspects of exchange structure, turn-taking, and inappropriate utterances of various types (see Appendix XIX for a list of the categories of inappropriacy under examination). Despite the subjectivity of the concept of inappropriateness most elements of the analysis are of demonstrated reliability. Bishop and Adams (1989) cited a correlation of .789 between the rates of inappropriate utterances coded by different observers, and a correlation of .888 for short-term test-retest reliability.

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[2] i.e. 50% of a normal distribution are above the mean and 15.9% are within one standard deviation below the mean.

Four cases from the autism group and 3 from the DLD group were excluded from this analysis as no audiotapes were available for them. This gave a total of 15 subjects in the autism group for whom ratings were obtained, and 17 in the DLD group.

Using the training materials provided by Bishop and Adams, ME achieved a high level of reliability in rating the utterances. Transcription and coding were carried out blind to diagnosis and to other information collected in the course of the follow-up study.

The summary measures used were:- total inappropriacy rate (number of inappropriate utterances divided by the total number of utterances and empty turns); positive inappropriacy rate (like the total inappropriacy rate, but excluding empty turns from the numerator and denominator); empty turn rate (empty turns as a proportion of all speaking turns) and initiation ratio (number of initiations or continuations divided by the number of responses to interviewer utterances). This latter measure, if low, would indicate a poverty of spontaneous comments and a high reliance on the interviewer to structure the conversation.

RESULTS

The first finding was that the autism group were showing substantially greater pragmatic impairment than the DLD subjects on all four summary indices. Because the autism group had a lower mean verbal IQ than the DLD group there was a concern that any differences in the degree or type of pragmatic impairment found in the two groups might simply reflect differences in basic language skills. In order to address this, the autism group was sub-divided into those with severe impairment in overall language level (i.e. with a score in one of the two poorest categories[3] of the ADOS measure:- overall level of non-echoed language) and those whose overall language level was higher. The result of the sub-division was a 'lower-functioning autism' group, and a 'higher-functioning autism' group whose mean verbal

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[3]Much echolalia, but some phrase speech; few words or no speech.

IQ and PPVT standard scores were closely similar to the DLD group. This is summarised in Table 14.5, below, together with the results of the analyses on the summary pragmatic indices.

The differences in rates of pragmatic impairment largely remained when the comparison was restricted to the higher-functioning autistic subjects. Only for the initiation ratio did the difference between the DLD and higher-functioning subjects fall slightly short of the two-tailed 5% significance level, suggesting that the pragmatic differences could not be explained by general impairments in verbal skills.

Nonetheless, despite the better performance of the DLD group, the distribution of the pragmatic errors in the two diagnostic groups did overlap. There are no normative data for the analysis used, but it did seem likely that some DLD subjects produced substantially more pragmatic errors than would be expected among normal subjects.

TABLE 14.5

GROUP COMPARISONS ON LINGUISTIC AND SUMMARY PRAGMATIC INDICES

	I DLD	II Autism (all)	III Autism (high)	IV Autism (low)	Probability of I = II	I = III
n	17	15	10	5		
Verbal IQ						
Mean	75.4	68.5	75.3	55.0	n.s.	n.s.
(S.D.)	(7.6)	(12.6)	(9.7)	(3.6)		
PPVT standard score						
Mean	64.5	45.0	56.0	23.0	p<.05	n.s.
(S.D.)	(19.1)	(24.8)	(22.6)	(10.0)		
Total inappropriacy rate						
Mean	.054	.342	.210	.605	p<.001	p<.01
(S.D.)	(.056)	(.236)	(.150)	(.137)		
Positive inappropriacy rate						
Mean	.039	.204	.141	.329	p<.01	p<.05
(S.D.)	(.036)	(.192)	(.118)	(.244)		
Empty turn rate						
Mean	.017	.162	.076	.332	p<.001	p<.02
(S.D.)	(.033)	(.184)	(.082)	(.211)		
Initiation ratio						
Mean	.527	.279	.364	.108	p<.01	n.s.
(S.D.)	(.216)	(.238)	(.242)	(.095)		

ME then looked at the relationships between measures of social behaviour and pragmatic impairment. He summed the scores across all items in the Reciprocal Social Interaction section of the ADOS[4] to produce an aggregated score, and then assessed its relationship with rates of pragmatic impairment by rank correlation. He found in both diagnostic groups that impairment in forming appropriate communicative intentions was closely related to more generalised impairment of reciprocal social behaviour. Among subjects with autism, higher rates of inappropriacy were associated with greater impairment of social interaction, especially positive inappropriacy and utterances lacking a relevant informative intention. These associations were particularly strong amongst those members of the autism group who were in the higher language functioning group. In the DLD group, there were similar associations, but the pattern was slightly different so that the features most strongly related to social impairment were empty turns and a low initiation ratio. These findings are summarised in Table 14.6.

TABLE 14.6

WITHIN-GROUP RANK CORRELATIONS (SPEARMAN'S r) BETWEEN ADOS IMPAIRMENT OF RECIPROCAL SOCIAL INTERACTION SCORE AND GLOBAL PRAGMATIC INDICES

	DLD	Autism (all)	Autism (high)
n	*17*	*15*	*10*
Total inappropriacy	.57[a]	.84[c]	.89[b]
Positive inappropriacy	.47	.75[c]	.92[b]
Empty turns	.65[b]	.52	.33
Initiation ratio	-.72[c]	-.58[a]	-.56

[a] $p < .05$, two-tailed probability that $r = 0$. [b] $p < .01$, two-tailed probability that $r = 0$.

[c] $p < .005$, two-tailed probability that $r = 0$.

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[4] Unusual eye contact; amount of social overtures; social distance; quality of rapport; quality of social response; quality of social overtures, socially unacceptable habits, smiling, amount of recrprocal social communication, appropriate greeting/parting and social disinhibition.

A further analysis was then carried out to disaggregate the different types of inappropriate utterances. Each inappropriate utterance was classified on two independent dimensions. Firstly, on whether it represented an impairment of communicative intention[5] or an impairment of execution[6]. These categories were based on the work of Grice (1957) and Sperber and Wilson (1986). The second dimension was the presence or absence of stereotyped language. This was rated as being present where a word or phrase was used by the speaker in an inappropriate repetitive manner, or where there was a clear suggestion of stereotyped repetition from another source (e.g. echolalia, advertising jingles inappropriately introduced into the conversation). The reliability of these ratings was shown to be adequate (kappa of .69 for the first dimension and .61 for the presence or absence of stereotyped language).

The full results are not given here, although they are available in Eales (1993). The major finding was that inappropriate utterances involving stereotyped language use, and those involving impairment of communicative intention, were much more frequent amongst subjects with autism. There was much less disparity between the groups for impaired execution and indeed *non-stereotyped* impairment of execution occurred as frequently in DLD subjects as in those with autism. Analysis was then carried out to invesigate the correlations between these measures of pragmatic impairment and the ADOS reciprocal social interaction score, described previously. The findings are displayed in Table 14.7, and show that impaired communicative intention was closely associated with greater social impairment, especially amongst the higher functioning members of the autism group. In both groups social impairment was associated with the use of stereotyped language, whereas nonstereotyped impairment of execution was unrelated to degree of social impairment.

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[5]Utterances that were inappropriate because a relevant communicative intention was lacking.
[6]Utterances that contained (or appeared to contain) a relevant communicative intention, but where the way in which this was expressed was inappropriate, that is, there was a lower level failure in the execution of a relevant intention.

TABLE 14.7

WITHIN-GROUP RANK CORRELATIONS (SPEARMAN'S r) BETWEEN ADOS IMPAIRMENT OF RECIPROCAL SOCIAL INTERACTION SCORE AND SUBTYPES OF PRAGMATIC IMPAIRMENT

	DLD	Autism (all)	Autism (high)
n	*17*	*15*	*10*
Impairment of communicative intention	.58[a]	.67[a]	.86[b]
Impairment of execution (nonstereotyped)	.07	.16	.38
Stereotyped language	.59[b]	.55[a]	.59

[a] $p < .05$, two-tailed probability that $r = 0$. [b] $p < .01$, two-tailed probability that $r = 0$.

SUMMARY

The data presented in this chapter suggest that in both groups there were deficits in social functioning. A large proportion of the autism group was unable to cope with the demands of the socio-emotional tasks and so there were no results available for them. Of those subjects for whom there were data, the DLD group were in general poorer on the tasks, although the autistic subjects were rated as more odd. These findings should be interpreted with some caution since only the higher-functioning members of the autism group were included and it was therefore not a straightforward comparison between the groups. Nonetheless the two sub-groups were comparable on verbal measures and this is evidence that the DLD group were especially poor in ways that could not be accounted for by verbal differences. In the domain of pragmatic deficits, the autistic subjects showed greater abnormality, but there

were indications nonetheless that the functioning of the DLD subjects fell short of being normal.

The data from these two areas are important since they are obtained in a different way from the other data presented here in Section B. The findings from psychometric assessments, observation and interviews have already indicated that both groups showed substantial impairments in social and communicative functioning in adulthood. The data provided here offer additional and independent confirmation that these types of difficulties are indeed present in both groups.

SECTION C

ADDRESSING THE ISSUES

In this section the aims of the study are addressed chapter by chapter, making use of the descriptive data presented in the previous section, and bringing in where relevant, data from the two earlier comparisons in early and middle childhood.

In Chapter Fifteen the autism group are considered in isolation so that the issue of pervasiveness in the disorder can be examined. Similarly, Chapter Sixteen addresses the issues that relate to the DLD group alone. There are two of these, firstly the nature of the association between developmental language disorders and socio-behavioural/educational problems, and secondly what predicts outcome in developmental language disorders. In Chapter Seventeen the findings from these two chapters are brought together so that the possible existence and nature of any relationship between autism and developmental language disorders can be explored. In the concluding chapter the findings are summarized, there is a discussion of the methodological issues and finally consideration of how future research might continue to explore and expand upon these issues.

CHAPTER FIFTEEN: HOW PERVASIVE IS THE DISORDER OF AUTISM IN ADULTHOOD?

Considerable controversy exists as to whether autism constitutes a truly pervasive disorder. Here, data are presented that allow the functioning of individuals with autism to be examined across a range of domains, and over time. Outcome in adulthood; changes in patterns of functioning; interconnections between language and social relationships, and predictors of outcome are all discussed, and new data relevant to the issue of pervasiveness are added to those already presented earlier.

EVIDENCE OF IMPAIRMENT IN ADULTHOOD

The descriptive statistics presented in Section B demonstrated that the majority of the subjects in the autism group continued to show considerable impairments in adulthood.

Thus, in the area of language functioning there was widespread evidence of continuing difficulties, with less than half (*42%*), speaking in sentences and using mature grammar. Amongst those who had better language there were still many who had difficulty in following the plots of television, film or written material, and over 75% of the group showed some difficulty in giving an adequate report of things that had happened to them, or in sustaining a conversation. The results from formal assessment confirmed that many of the group continued to have substantial language impairments. A very high percentage (*68%*) of the group, for example, had age-equivalents below 10 years on the PPVT. In addition to having language that was developmentally retarded, a number of subjects were found to show a persistence of deviant language behaviours, especially pronominal reversal, echolalia and stereotyped phrases.

So too, with social functioning, there were considerable problems and the majority lacked friendships. In many other areas there was evidence that the autism group were functioning at levels below what would be expected on the basis of their chronological age. Thus the majority of subjects had age-equivalent scores considerably below the test ceilings for reading accuracy, reading comprehension and spelling. Similarly, levels of independence as measured on the Vineland Daily Living Skills scale showed considerable overall impairment. Although 2 subjects had high academic achievements and had gained university entrance; another was taking A'Levels and a fourth had completed a music foundation course, the remainder had no experience of higher education. Several subjects were in paid employment but the greatest proportion were attending day centres. About a third of the group had experienced problems at work or in their day programs and in several cases these were serious enough to result in their removal from the program. Deviance in language functioning has already been mentioned and there was considerable evidence of deviant functioning in other domains. A number of individuals showed oddities of: facial expression; smiling, and in integrating their verbal and non-verbal communication. In addition there was evidence of socially disinhibited behavour and difficulty in understanding humour. Some subjects continued to show some of the repetitive or stereotyped behaviours typically associated with autism, such as unusual preoccupations; compulsions/rituals; resistance to change; unusual sensory interests; hand and finger or other stereotyped body mannerisms; unusual gait, and verbal rituals. Looking at more general behaviours, 67% showed either significant or intermediate levels of maladaptive behaviours on the Vineland Scales.

Interesting evidence on patterns of impairment in other areas of social functioning came from the results of the socio-emotional tasks. Results were not available for the most linguistically-impaired members of the group as they were not able to understand the requirements of the task[1], and so the findings relate only to those with better language. When compared with normative data from the study by Macdonald et al. (1989) they

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[1] Although it seems likely on the basis of clinical judgement that this untestable group would have shown deficits in these areas had it been possible to test them.

appeared to be considerably impaired in their ability to recognise emotions in both the vocal and facial modalities. Only 2 subjects correctly identified all emotions in the facial recognition task and none achieved the maximum score in the unfiltered block of the vocal recognition task. Normative data for the 'oddity of expression' measure are lacking, making it difficult to interpret the results, but the autism group was found to have more problems than the DLD group in both modalities, the difference reaching the 5% significance level (two-tailed) in the vocal modality. Similarly, the analysis of pragmatic impairments revealed considerable communicative problems that could not be accounted for by general impairments in verbal skills.

In order to allow some quantification of these data a new measure was devised - the Overall Composite Score. This was comprised of composite variables of language, sociability, independence and autistic-type behaviours, and thereby provided a reasonably comprehensive assessment of functioning. The Friendship Rating has already been described (see p. 173), as have the Composite Independence Level (see p. 197) and the Behaviour Composite Score (see p. 211). The Language Composite Score, however, has not been introduced previously and was derived from several items of data. The advantage of this measure over, say the PPVT, was that it provided information about functioning in real-life situations rather than just measuring syntactic or semantic competence. Subjects were categorized into four groups ranging from 'good' language to 'very poor language'. 'Good' language required that the subject could 'use sentences with mature grammar, understand 2-3 step instructions, and talk with others so that the conversation flowed and built on the other person's dialogue'. Subjects who scored positively on two of these three linguistic items were given a rating of 'fair'; those who scored positively on only one were rated as 'poor', and those who scored on none of these activities were rated as 'very poor'.

TABLE 15.1

LANGUAGE COMPOSITE SCORES IN THE AUTISM GROUP

Level of functioning on 'Language Composite Score'	n	
Good	4	*(21.1%)*
Fair	3	*(15.8%)*
Poor	1	*(5.3%)*
Very poor	11	*(57.9%)*
TOTAL SUBJECTS	19	

Table 15.1 shows that only 4 members of the group were, on this basis allocated to the 'good' language group; 3 had 'fair' language; 1 had 'poor' and 11 had 'very poor' language. There was found to be a very high degree of association between this derived measure of functional language and the PPVT, so that in a rank comparison of scores on the PPVT and Language Composite Scores the 4 subjects with 'good' language were found to hold the 4 highest ranks on the PPVT. Of the 11 with 'very poor' language, 10 held the lowest 10 ranks on the PPVT. This analysis suggests that the derived measure is a valid indicator of linguistic functioning. It makes a new contribution to the data by revealing just how few of the autism group had language that was functionally adequate for the demands made by adult interactions.

Both the Language Composite Score and the Friendship Rating had 4 categories whilst the Composite Independence Level and the Behaviour Composite Score had 3. In order that they should all have the same number, the two poorest levels in the Language Composite Score were combined, as were the two poorest in the Friendship Rating. This resulted in each of the component scores having a range of values from '0' to '2', where '0' was the most normal rating, and '2' the poorest. The scores were then aggregated to give the Overall

Composite Score with a range of scores from '0' to '8'. Subjects scoring '0' or '1' were classified as functioning at 'near normal' levels; those with scores of '2' to '4' as 'moderate' in functioning, and any who had scores of '5' or greater as having 'considerable' levels of difficulty. The results of this breakdown of scores are given in Table 15.2.

TABLE 15.2

OVERALL COMPOSITE SCORES IN THE AUTISM GROUP

Level of functioning on 'Overall Composite Score'	n
Near normal	3 (*15.8%*)
Moderate	2 (*10.5%*)
Considerable difficulties	14 (*73.7%*)
TOTAL SUBJECTS	19

It can be seen from Table 15.2 that almost three-quarters of the autism group were assessed as having considerable difficulties in overall level of functioning. The 3 individuals in the 'near normal' group were all members of the 'good language' group. An indication of what these levels of functioning meant in practice can be obtained by reading the vignettes in Appendix VII. Subjects A3, A18 and A19 made up the 'near normal' group; A7 and A15 were rated as having 'moderate' problems and the remainder of the subjects came in the 'considerable difficulties' group.

A further analysis was carried out to investigate the number of areas where individual subjects showed impairment. The four scores used for the Overall Composite Score were examined and subjects were rated as 'unimpaired' in 4 areas if they had 'good language'; 'normal friendship(s)'; 'full independence' and a 'none/minimal' rating for autistic-type behaviours. Any impairment in any of the areas was noted and Table 15.3 summarises these findings on the range of impairment in the autism group.

TABLE 15.3

RANGE OF IMPAIRMENT IN THE AUTISM GROUP

	n
'Impairment' in all 4 areas	11 *(61.1%)*
'Impairment' in 3 areas	3 *(16.7%)*
'Impairment' in 2 areas	1 *((5.6%)*
'Impairment' in 1 area	2 *(11.1%)*
No 'impairment' in any of the 4 areas	1 *(5.6%)*
TOTAL SUBJECTS	18

Table 15.3 shows that by far the majority of the group were showing impairment in all 4 areas. Only 1 subject (A3) was rated as having no impairment in any of the areas. The mean number of 'areas with impairment' for the group overall was 3.2.

IS THERE EVIDENCE OF IMPAIRMENT IN THOSE WITH 'GOOD' LANGUAGE SKILLS?

Whilst it is clear from the results above, that many members of the group had very poor linguistic abilities, there were also others whose functioning in this area was much better. Indeed there appeared to be considerable heterogeneity within the autism group. This was evidenced by the notably high standard deviation on the WAIS Verbal IQ, which at 21.7 was almost three times higher than that of the DLD group (*7.8*). The standard deviation on the PPVT raw score was high at 47.3 (*that of the DLD group was 23.3*), and analysis of the quartile scores on the Expressive One Word Picture Vocabulary Test, and on the reading and spelling tests also revealed considerable variability. Given the wide range of linguistic ability, it was decided to sub-divide the group according to their Language Composite Scores, thereby allowing the sub-groups to be examined separately in certain analyses.

In general, the subjects in the 'good language' group appeared to have done well in many areas. For the sake of consistency, in the text that follows, these subjects are given the same identifying labels as in Appendices VI - VIII, the tables that display their psychometric test results at Times 1, 2 and 3[2]. Based on the informant data none of them showed any clear-cut evidence of deviant language, although 2 (Subjects d and k) had minor prosodic oddities and Subject k was also reported to have slightly reduced levels of vocal expressiveness. Table 15.4 summarises their educational attainment levels for reading accuracy, reading comprehension and spelling, as well as giving their verbal IQ's, and Table 15.5 provides a summary of whether they had any sexual relationships and friendships; whether they were working, and whether they had experienced any work-related problems currently or in the past.

TABLE 15.4

ATTAINMENT LEVELS OF AUTISM SUB-GROUP WITH GOOD LANGUAGE

		ATTAINMENT AGE EQUIVALENTS		
	Verbal IQ	Reading Accuracy*	Reading Comprehension**	Spelling***
Subject b	122	17y 0m	16y 0m	15y 0m
Subject d	86	17y 0m	14y 9m	14y 8m
Subject j	91	17y 0m	14y 9m	14y 5m
Subject k	121	17y 0m	16y 0m	14y 6m

**Ceiling score = 17 years; ** Ceiling score = 16 years; ***Ceiling score = 15 years*

[2]Subjects from the autism group were given lower case labels and those from the DLD group, upper case labels.

Table 15.4 shows that without exception this sub-group had done well in terms of educational attainments. All 4 subjects scored at ceiling level for reading accuracy; 2 were at the ceiling level for reading comprehension and the other 2 were above 14 years, and for spelling they were all either at the ceiling level or within a few months of it.

TABLE 15.5

A SUMMARY OF ASPECTS OF SOCIAL FUNCTIONING AND EMPLOYMENT IN AUTISM SUB-GROUP WITH GOOD LANGUAGE

	Has friends	Has sexual relationships	Currently employed	Without any history of work-related difficulties
Subject b	Yes	No	Student	Yes
Subject d	No	No	Day centre	Yes
Subject j	Yes	No	Yes	Yes
Subject k	Yes	No	Yes	Yes

Table 15.5 shows that 3 members of this sub-group did have friends. Indeed looking at the autism group as a whole it was found that whilst only 1 of the subjects with 'good' language had no friends, all those with very poor language lacked close social relationships. Looked at from another angle, all the subjects who had 'normal friendships" also had 'good' language.

Moving on to look at sexual relationships in the 'good' language sub-group, however, Table 15.5 reveals that despite being young men in their twenties they had a distinct lack of sexual relationships. Only 1 (Subject j) had ever had a girlfriend. This was his only such relationship, however, and although they showed each other affection they did not ever have a fully sexual relationship. It had ended by the time he was interviewed. Although this sub-group lacked experience of relationships with the opposite sex, 2 showed an apparently normal interest in the prospect of marrying one day (b & j). A third (k) had coherent plans for the future, but marriage was not included in these, whilst the fourth (d) appeared not to

understand about the shared emotional aspects of marriage, and the issue had no real relevance to him.

The outcome for work experience in the 'good language' group was somewhat mixed. One individual (k) was working as a laboratory assistant, whilst studying for an MSc. He appeared to be coping with the demands of the job and making appropriate use of his experience and qualifications. A second (b) was, at the time of assessment, re-taking undergraduate exams. This suggested that he might have had some difficulty in coping with the demands made by his university course, but when he was followed-up a few years later it was found that he had successfully completed his degree, had done an MSc. and was, like the other individual, working in a laboratory-based job. It was interesting to note that both these young men had chosen careers that involved limited contact with people. The third member of the group (j) appeared to be having more difficulty in achieving his ambitions, as although he had considerable musical talent he lacked the necessary academic qualifications to pursue his musical studies at a higher level, and at the time of contact was about to start a new job. The fourth individual (d) was in residential placement and not engaged in any form of employment. Subjects b and k were living independently away from home and Subject j still lived with his parents. These 3 members of the group were rated as having 'adequate' levels of independence on the Vineland Scales and Subject d was rated as 'moderately low' for independence.

The remaining data on functioning in other areas revealed that 3 of these subjects had some other example of impaired or odd behaviour. Thus, in the category of deviant behaviours, there was little definite evidence of impairment but all 3 had 'marginal' codings on several behaviours. One (d) was slightly socially disinhibited, showed marginal evidence of hand and finger mannerisms and had a slightly odd gait; the second (k) had a marginal rating for hand and finger mannerisms as well as a rather literal understanding of humour, and the third (j) had a marginal rating for 'linkage of verbal and non-verbal communication', a literal sense of humour and limited eye-contact.

Results on the socio-emotional tasks were not available for 2 members of the 'good language' group (in 1 case (k) due to practical difficulties and in the other (b) because of refusal to participate in the tasks), but the remaining 2 (d & j) scored above the mean on the recognition tasks. One (j) had oddity ratings below the mean in both expressive modalities, but the other was rated as being relatively odd on both expressive tasks. For the facial task his oddity rating was more than one standard deviation above the mean, and for the vocal task it was again above the mean, although within one standard deviation of it. Nonetheless, despite having difficulties in some areas of these tests, both subjects had Socio-Emotional Composite Scores that were close to the mean, when compared with the control subjects in Macdonald et al's (1989) research.

These findings taken together suggest that even for those subjects who had a relatively good outcome there were at least some persisting areas of difficulty and oddity.

DATA FROM THE ADOS ALGORITHM

Another area of data that was examined in looking at pervasiveness in adulthood was that from the ADOS. The individual ratings from this schedule were entered into the ADOS algorithm (see Appendix XX). Both the social criteria and the communicative criteria had been shown in the validity study carried out by Lord and her colleagues (1989), to be successful in differentiating subjects with autism from mentally-handicapped and normal groups. Many children who regularly showed restricted and stereotyped behaviours and interests, on the other hand, were found not to have demonstrated them during the 20-minute observation period and so these behaviours were less good at differentiating autism from other groups. In the current study, data were available for 18 members of the group, and the findings are displayed in Table 15.6.

TABLE 15.6

AUTISM GROUP DATA FROM THE ADOS ALGORITHM

Subjects reached cut-off point for abnormality in:'	n
Social and communication areas only	9 (*47.3%*)
Social, communication and restricted behaviours	5 (*26.3%*)
No areas	4 (*21.1%*)
Missing data	1 (*5.3%*)
TOTAL SUBJECTS	19

Fourteen individuals were found to reach the cut-off point for abnormality in both the 'social' and 'communicative' areas, and of these, 5 also reached the 'abnormal' level for 'restricted and stereotyped interests and behaviours'. This meant that in adulthood there were 4 subjects who were not in the 'abnormal' range for 'social' or 'communicative' criteria using the ADOS algorithm. Three of these were from the 'good language' group and the other was rated as having 'fair language'. The subject with missing ADOS data (b) was the fourth member of the 'good language' group. Although definite conclusions cannot be drawn without the benefit of the ADOS data, the author's impression from having met him was that he would not have met the criteria for abnormality in any of the three areas. This meant that in adulthood none of the subjects with 'good language' met the ADOS criteria for abnormality in the 'social' and 'communicative' areas.

CHANGES IN COGNITIVE FUNCTIONING OVER TIME

Looking at patterns of cognitive functioning over time also provided valuable information as to the pervasiveness of the disorder in adulthood. Before doing this, however, one of the difficulties that needed to be resolved was what to do with missing data. At Time 1, WISC Verbal Scale IQ's were only obtained for 9 subjects, and it was not recorded in the available

information exactly why these data were missing. Subjects may have been untestable because they had scores below the floor of the test, or on the other hand because disruptive behaviour made it difficult to test them, and it is likely that there were at least some children in each of these categories. Rather than lose the data altogether it was decided to allocate WISC Verbal IQ's to each of these individuals by examining the results of other tests at Time 1 for which there were scores and making a judgement about the most likely reason for the missing data. Of the 10 children with missing verbal IQ scores there appeared to be 8 who had particularly poor verbal abilities. They occupied 8 of the 9 lowest ranks for scores on the Reynell Comprehension Scale, and it was assumed therefore that the reason for their missing WISC data was an inability to cope with the demands of the test. One of the remaining 2 subjects was ranked 12th out of 19 on the Reynell and in combination with a relatively low PPVT standard score (*50*), it was assumed that his verbal abilities were also poor. For these 9 subjects it was decided to allocate scores on a random basis in the range 40-45[3]. There was evidence that the last subject, however, had better verbal abilities since he achieved the highest rank on the PPVT, and it was considered unlikely that the reason for his missing data was poor verbal abilities. On this basis he was allocated a verbal IQ of 67, which was the mean score of the 9 subjects for whom WISC Verbal IQ's were obtainable at Time 1. At Time 3 one subject remained untestable and he was randomly assigned a score of 45 from the range 35-45, chosen on the basis of clinical judgement.

Performance IQ's were available at all three time-points, although not on all children. At Time 1 the performance IQ's were derived either from the WISC Performance scale or the Merrill-Palmer Scale of Mental Tests. The issue of whether results from these two tests can be legitimately combined has already been addressed in Chapter Five, where it was agreed that they could. Since there were a certain amount of missing data at Time 2, the complete

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[3]Although a lower range could have been selected, this range was chosen for the sake of conservatism. It will be seen further on in this section that the general trend was towards an increase in verbal IQ scores between Times 1 and 3. Selecting a lower IQ range would therefore only have increased the magnitude of this difference. Nevertheless this issue needs to be taken into account when interpreting the data on changes in verbal IQ. It was found that the mean increase of those who had verbal IQ scores randomly assigned was similar to those who did not.

data at Times 1 and 3 will be examined here first, followed by an analysis of the sub-group with complete data at *all three* time-points.

So, taking performance IQ first, there was a decrease of more than 11 IQ points in the means between Times 1 and 3 (*means = 94.3 vs 82.8 at Times 1 vs. Time 3, S.D.'s = 11.4 vs. 13.1).* Although a t-test showed a significant difference in the scores at the two time-points, *(t = 3.84, d.f. = 17, p = 0.001*), these results must be interpreted with caution for the time being due to the issue raised in Chapter Four (p. 92) concerning the comparability of different forms of the Wechsler test. This issue will be discussed more fully in Chapter 17.

FIGURE 15.1

INDIVIDUAL CHANGES IN PERFORMANCE IQ FROM TIME 1 TO TIME 3 IN THE AUTISM GROUP

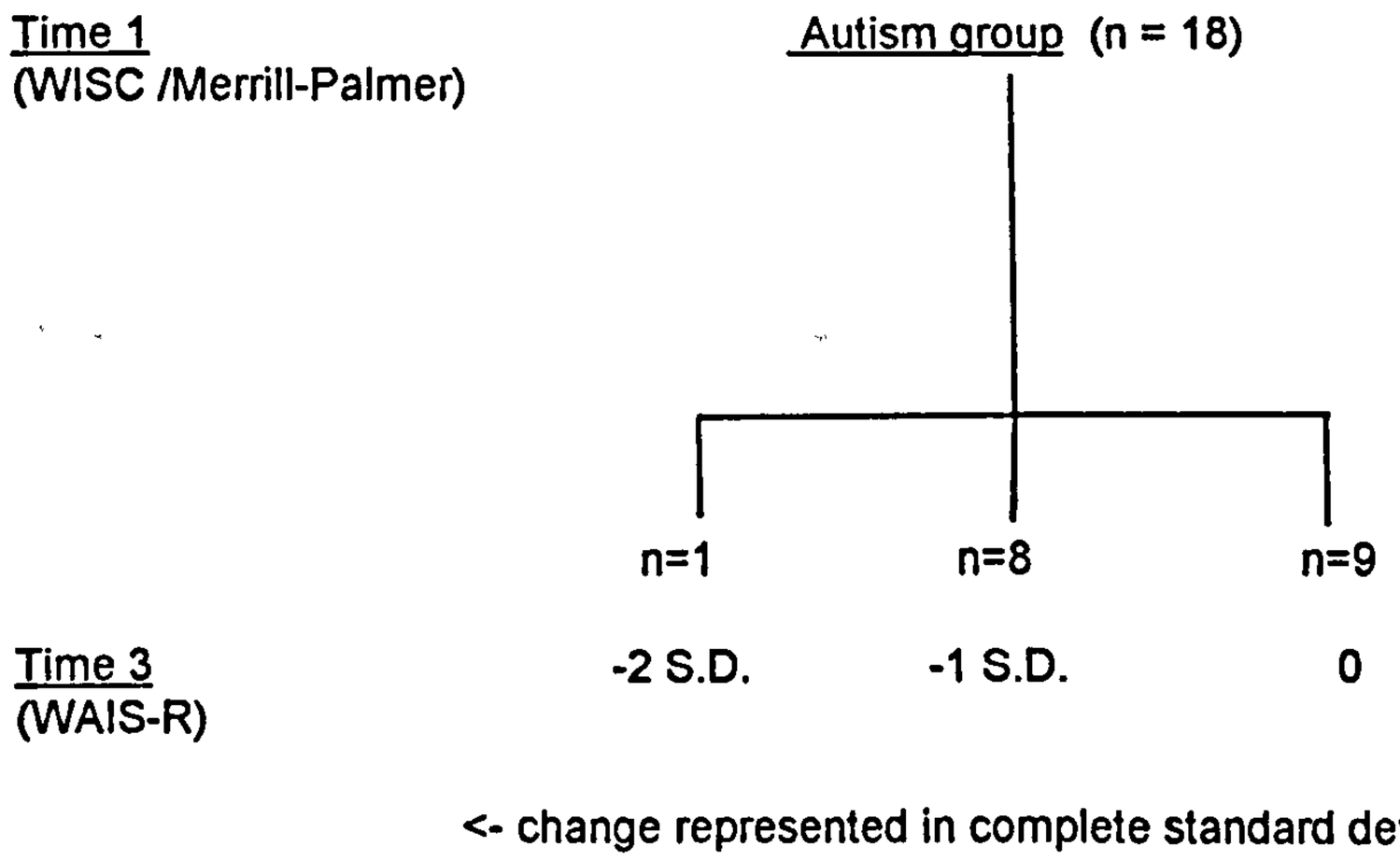


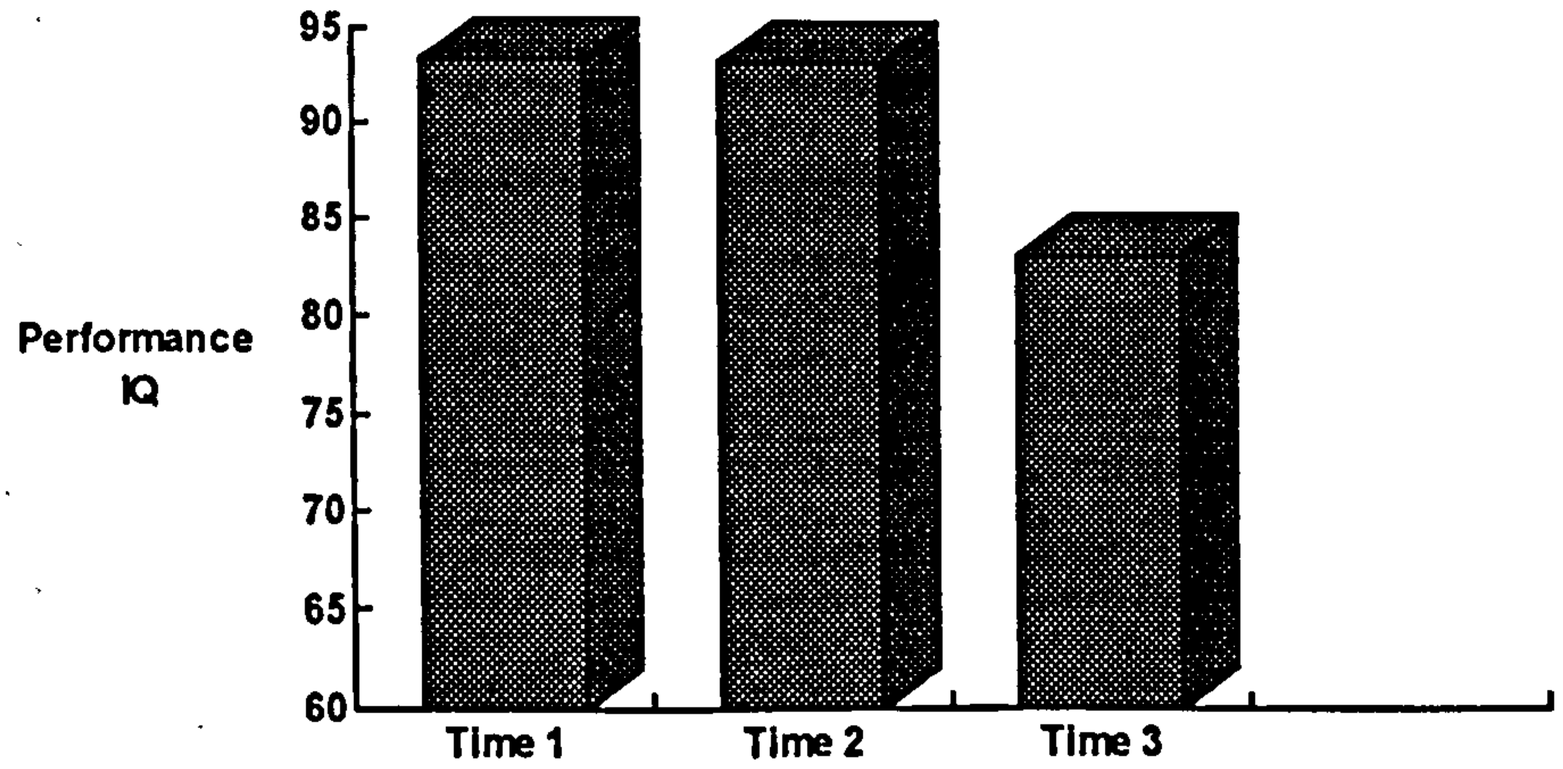
Figure 15.1, above, provides a more detailed analysis of the change in performance IQ and shows how that of the individual members of each group differed at Times 1 and 3. This

change is represented as the IQ difference, in complete standard deviations, between the two time-points. It is clear from Figure 15.1 that all the subjects who showed a change of 1 standard deviation or more at Time 3 had a reduction in performance IQ.

Looking next at the sub-group who had scores at all three time-points, Figure 15.2 shows that the mean scores at Times 1 and 2 were very similar (*93.3, S.D. = 10.1 at Time 1 vs 93.1, S.D. =11.7 at Time 2*). The mean at Time 3 was somewhat lower at 83.0 (*S.D. = 13.2*).

FIGURE 15.2

MEAN PERFORMANCE IQ'S IN AUTISM GROUP AT TIMES 1, 2 AND 3

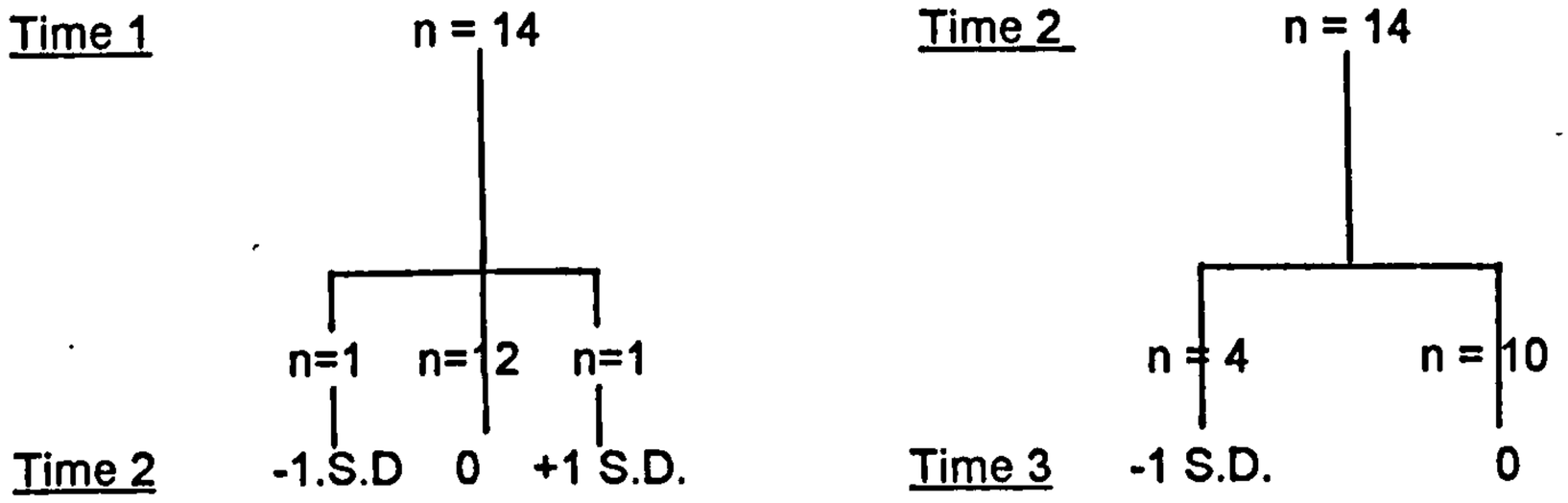


Analysis of the individual changes between Times 1 and 2 and Times 2 and 3 revealed that for the majority of subjects the change at each stage was less than 1 standard deviation. These results are displayed in Figure 15.3.

FIGURE 15.3

INDIVIDUAL CHANGES IN PERFORMANCE IQ IN THE AUTISM GROUP

BETWEEN TIMES 1 AND 2, AND BETWEEN TIMES 2 AND 3



<- change represented in complete standard deviations ->

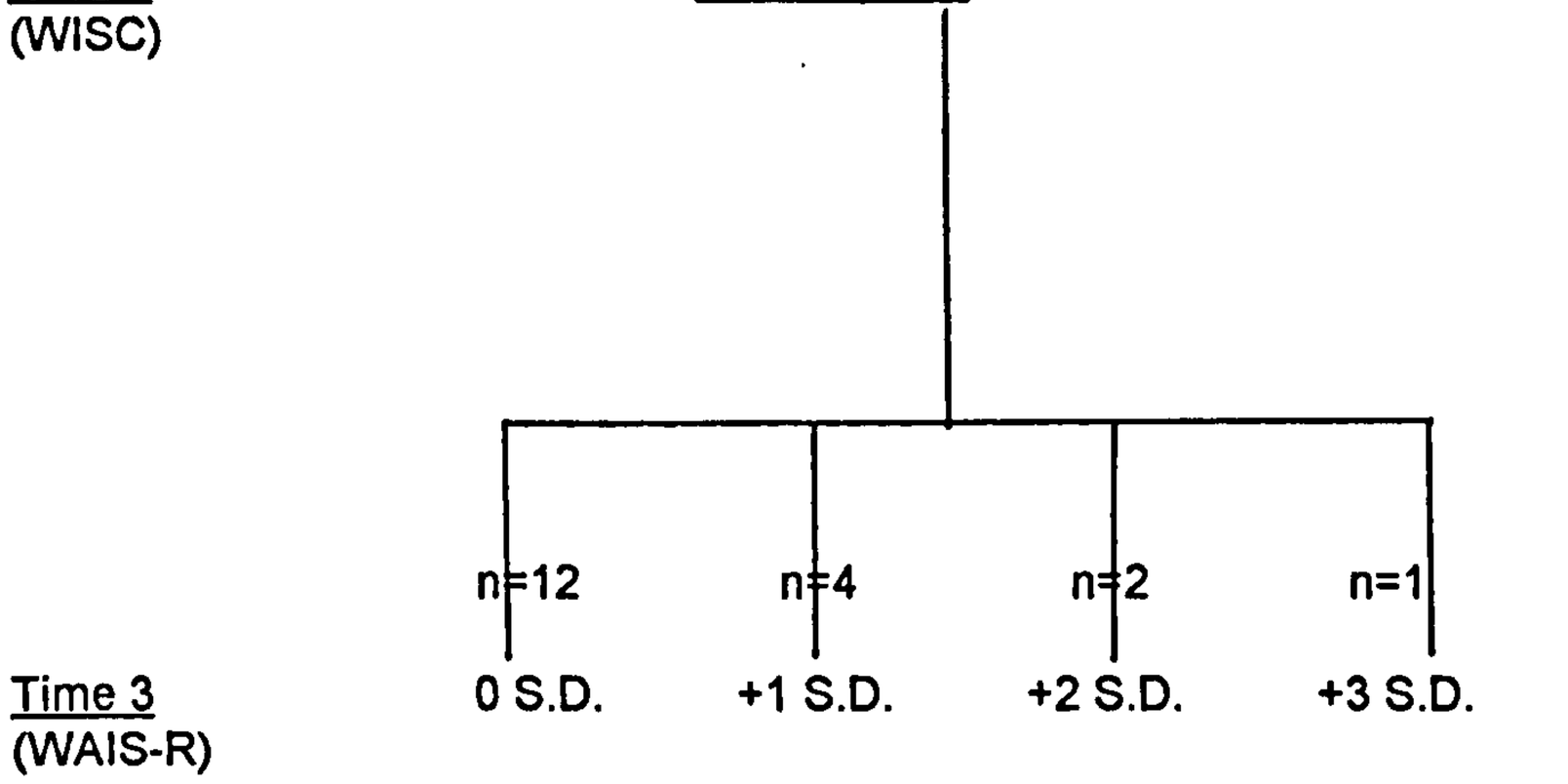
Analysis of changes in verbal IQ over time revealed a very different pattern of change to that found for performance IQ. The mean verbal IQ showed an increase over time (*means = 55.3 vs. 73.3; S.D.'s = 16.6 vs. 21.7 for Time 1 vs. Time 3*). This difference in means at the two time-points was statistically significant ($t = 5.46$; $d.f. = 18$, $p < 0.001$). Although, as with performance IQ, a note of caution needs to be sounded because of the difference in the form of test used, this level of increase does appear to be larger than was cited in the literature (see p. 92)[4]. The mean increase between Times 1 and 3 was 16.5 IQ points (*S.D. = 12.8*). The mean increase of those who had verbal IQ scores assigned to them was similar to that in the testable group (*17.1 vs. 15.8; S.D.'s = 11.7 vs. 13.8*), (see footnote on p.45).

A more detailed demonstration of individual changes in verbal IQ is given in Figure 15.4, below, where the change is represented as the IQ differences in complete standard deviations between the two time-points 1 and 3.

[4]Even allowing for the fact that there were no tests that directly compared the two forms of test used here.

FIGURE 15.4

INDIVIDUAL CHANGES IN VERBAL IQ BETWEEN TIMES 1 AND 3 IN THE AUTISM GROUP



In contrast with the performance IQ's where all subjects had either stayed within 1 standard deviation of their original score, or had shown a decrease, the verbal IQ's of all subjects had either remained at a similar level or had shown an increase. 37% (*n* = 7) had shown an increase of at least 1 standard deviation, and 1 had shown an increase of 3 standard deviations. This particular individual was not amongst the subjects who had arbitrary scores allocated to them.

The results from the PPVT were particularly valuable in examining patterns of change, since this test was administered at all 3 time-points. The difficulties in making use of actual standard scores at Time 3 have already been noted (see p.153) and so the information here is presented in terms of the percentage of subjects at each time-point who achieved a standard score above 70. Data covering all time-points were only available for 14 subjects, the loss being mainly due to missing data at Time 2. A summary of the findings are given in Table 15.7.

TABLE 15.7

A SUMMARY OF PPVT RESULTS IN THE AUTISM GROUP AT TIMES 1,2, AND 3

	n	Std score above 70	Mean std score	*S.D.*
Time 1	14	1 (*7.1%*)	51.8	*13.5*
Time 2	14	6 (*42.9%*)	66.7	*25.9*
Time 3	14	4 (*28.6%*)	52.1	*33.1*

Figure 15.5, gives a graphic display of how the performance on this test changed with increasing age. It can be seen from this chart that the highest percentage of subjects scoring above a standard score of 70 was at Time 2 (*42.9%, n = 6*), and the lowest percentage was at Time 1 (*7.1%, n = 1*). The figure for Time 3 was 28.6% (*n = 4*). The mean standard score at Time 1 was 51.8 (*S.D. = 13.5*). By Time 2 the tendency was for the scores in this group to have improved (*mean = 66.7, S.D. = 25.9*). In order to obtain some comparative measure a mean standard score for Time 3 was calculated, but it should be noted that this is likely to be an overestimate since 2 members of this group with complete data did not reach the basal standard score of 19, but for the purposes of calculating the mean they were allocated scores of 19. It was not felt possible to allocate scores in the range below this with any degree of safety since the standard scores in the lower range had already been extrapolated (see Appendix VI for method). The opposite end of the scale did not present any problem as none of the subjects scored at the ceiling level. The resulting mean standard score in adulthood was 52.1; (*S.D. 33.1*). Analysis of variance on this group with complete data, with time-point as the independent variable did indicate a significant difference in PPVT standard scores between the time-points ($F = 3.88$; $d.f. = 2, 26$, $p < 0.05$). This finding needs to be treated with some caution because of the change in the form of test used, but this issue will be returned to in Chapter 17.

FIGURE 15.5

PERFORMANCE ON THE PEABODY PICTURE VOCABULARY TEST IN THE AUTISM GROUP AT TIMES 1, 2 AND 3

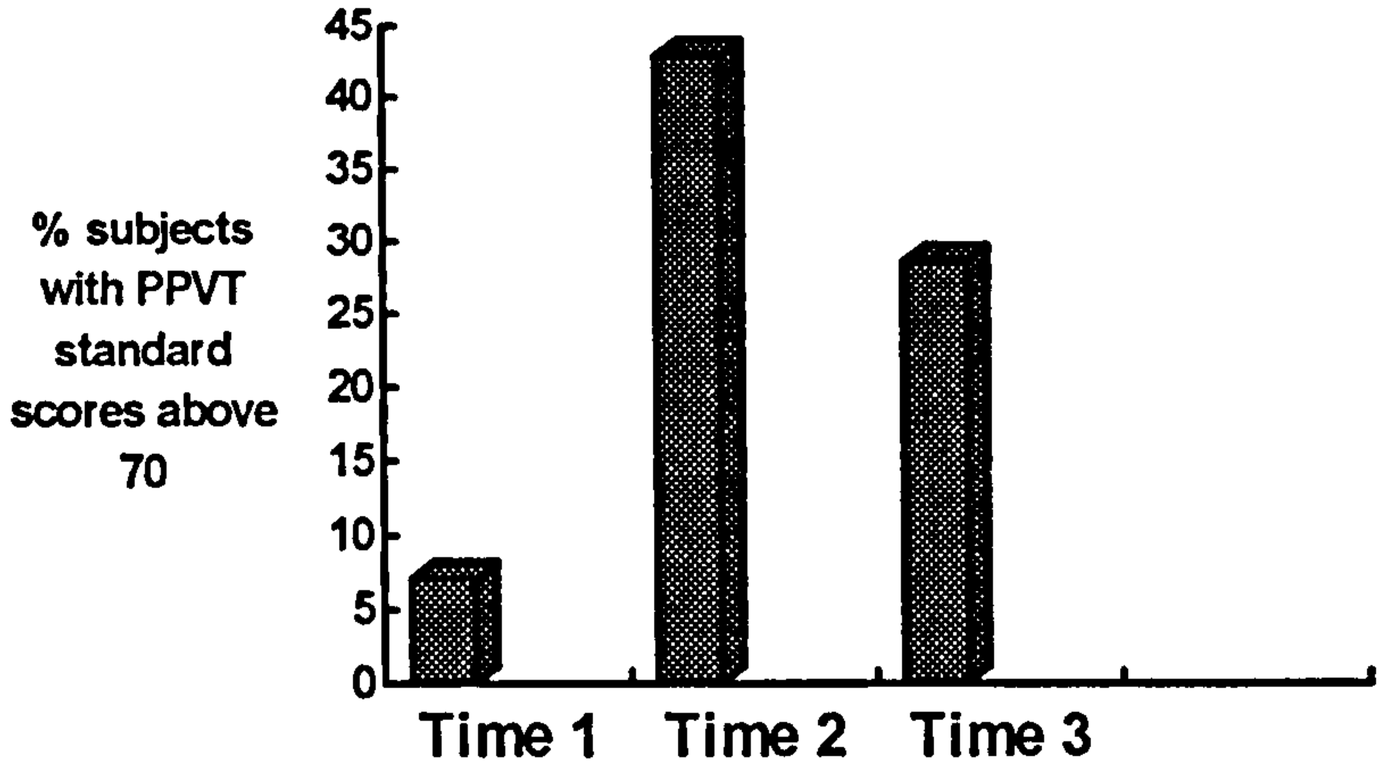
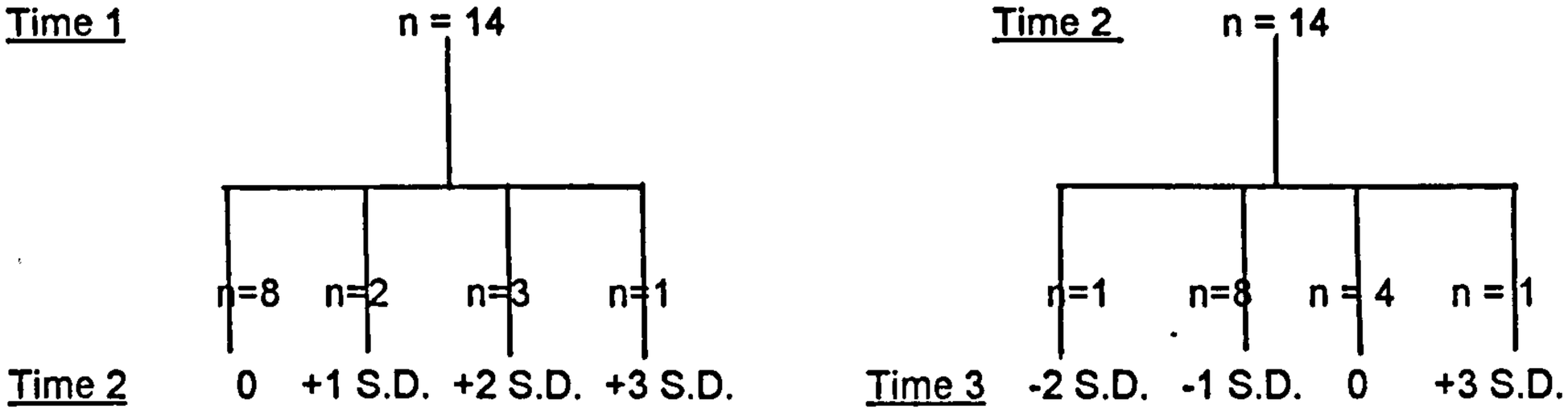


Figure 15.6 provides a more detailed analysis of the apparent changes in PPVT standard scores and shows how the individuals in each group changed between Times 1 and 2, and between Times 2 and 3. Each time the change is represented as the standard score difference in complete standard deviations between the two time-points in question. It can be seen from Figure 15.6 that all the changes between early and middle childhood were in a positive direction. Between middle childhood and adulthood, however, the tendency was for the autism group to show an apparent *decrease* in standard score. although there was one member of the group who appeared to show a large increase.

FIGURE 15.6

INDIVIDUAL CHANGES IN PPVT STANDARD SCORE IN THE AUTISM GROUP BETWEEN TIMES 1 AND 2, AND BETWEEN TIMES 2 AND 3



These findings add evidence to those already demonstrated by the Wechsler Verbal IQ results that the overall trend is towards an increase in verbal functioning with time. What they appear to show, in addition, however, is that the majority of this change took place in childhood.

These results have shown that many of the autistic subjects appeared to improve in verbal IQ between childhood and adulthood and yet the Language Composite Scores described earlier in this chapter demonstrated a continuing impairment in the majority of the group. The relationship between improvement in verbal IQ and current language impairment was therefore examined. Thirteen individuals showed an improvement in verbal IQ, and of these, 4 were described as having 'good' language functioning, 1 as 'marginal' and 8 as 'poor'. All but one of this 'poor' group were, however, previously untestable and because of the extent of their difficulties at Time 1 they were the most likely to show continuing difficulties at Time 3. These findings are in keeping with those discussed in Chapter One (p. 48) where studies of older age-groups have found that many high-functioning individuals with autism show an

improvement in their verbal IQ scores and may have better verbal than performance scores as they grow older. Their social use of language is, however, still likely to be impaired, and this is one of the aspects of language that are incorporated in the Language Composite Score.

Before concluding this section it is necessary to address the issue of whether these patterns of change could have arisen because of standardization problems across the age-groups in any of the tests employed. These sorts of problems might arise if the samples used to obtain the standardization data in the various age-bands differed in some way that influenced the findings. Taking non-verbal functioning first, the Wechsler results showed an apparent decline between middle childhood and adulthood. A very similar pattern of change will be shown in Chapter 16, which follows, and deals with the data from the DLD group. The finding that both groups showed the same pattern of change across the three time-points means that the possibility of standardization problems cannot be ruled out. With regard to the verbal tests, the patterns of change were somewhat different, both between the two tests and between the two diagnostic groups as will be seen in the next chapter. The tests measure somewhat different aspects of language functioning and so it is perhaps not unexpected that they would show different patterns. The finding that the two groups show different patterns, however, makes it highly unlikely that any pattern of change across time can be attributed solely to standardization problems in the tests.

THE RELATIONSHIPS BETWEEN VERBAL AND NON-VERBAL FUNCTIONING

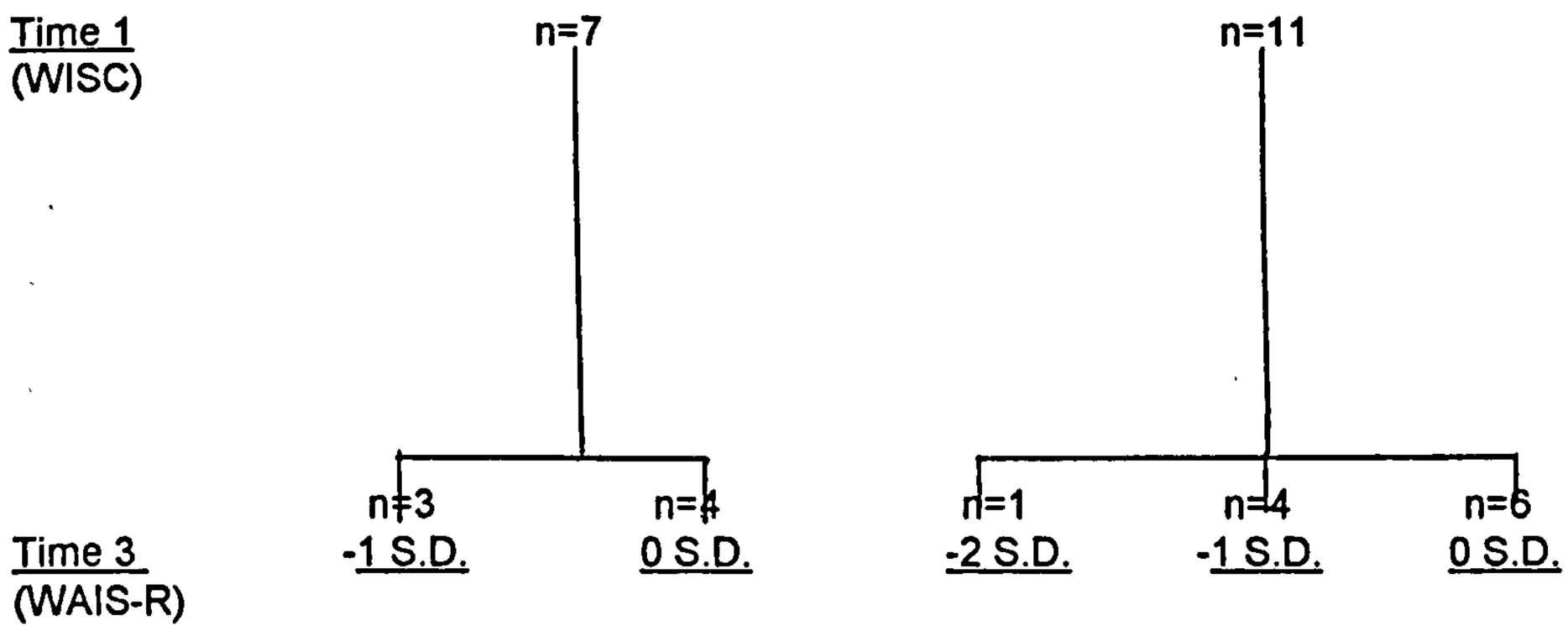
It has already been seen in the results from the initial comparison of the groups that at Time 1, scores were lower on the Verbal Scale than on the Performance Scale. This discrepancy was reconsidered taking into account the newly incorporated, estimated data for those

subjects who did not have a Verbal IQ score in childhood. This showed that the mean difference between Verbal and Performance IQ at Time 1 was 37.7 IQ points (*S.D. = 14.4*). The WISC manual does not supply data on the standard error in comparison between the two scales, but simple inspection shows that this is a large difference. The WISC-R *does* provide data on the differences between verbal and performance IQ's, however, and indicates that in the age range of 7.5-8.5 years a difference of 11.9 points would be considered significant at the 5% level. Notwithstanding that these particular data come from a different version of the test, a difference of 37.7 points is huge by any standard. The major question resulting from this finding was whether such a pattern of difference continued in adulthood. Analysis of the adult data has already revealed that with all subtests included in the analysis there was a difference of 9.5 IQ points (*S.D. = 16.6*) between the two scales. This difference, although noteworthy, was clearly much smaller than the mean difference at Time 1 which had been 37.7 points. Taking into account the standard error data of the WAIS-R (Wechsler, 1981) this difference was non-significant ($p > 0.05$).

The group who showed an increase of 1 standard deviation or more in Wechsler verbal IQ, were examined in more detail to see what had happened to their performance IQ's. Figure 15.7 summarises these findings.

FIGURE 15.7

THE RELATIONSHIP BETWEEN PERFORMANCE IQ AND VERBAL IQ IN THE AUTISM GROUP



A t-test in which the performance IQ changes of those in the increased verbal IQ group, were compared with those who did not show a verbal increase, failed to show any significant difference ($t = 1.42$, $d.f. = 17$, *n.s.*).

The patterns of cognitive functioning in the 'good language' group were also examined in more detail. For performance IQ, 2 had stayed within 1 S.D. of their Time 1 scores and 2 had decreased their scores by at least 1 S.D. With regard to verbal IQ, all had shown an increase, 2 went up by 1 S.D., 1 went up 2 S.D.'s and the fourth showed an increase of 3 S.D.'s. This pattern was not discernibly different from that in the group as a whole. An aspect in which they did appear to differ from the rest of the group was that at Time 3, there were 3 who had verbal IQ's that were higher than their performance IQ's. All other members

of the autism group showed the reverse pattern. The 1 member of the 'good language' group who did not show a better verbal than performance IQ score (d) was the individual who showed the most evidence of deviant behaviour.

INTERCONNECTIONS BETWEEN LANGUAGE AND SOCIAL RELATIONSHIPS

The next issue to be investigated was whether social functioning varied according to changes in levels of linguistic ability. The term 'social functioning' can cover a range of different behaviours, including how individuals interact with others; how they use their leisure time and how they demonstrate sensitivity to others. It can also be used to refer to how they cope with skills such as shopping, using the telephone and other aspects of independent functioning. For the analyses within this section, it was decided to concentrate on whether or not the subjects had experience of friendship. This measure was chosen, firstly, because experience of friendship was considered to be a very valuable indicator of social adjustment in adulthood, and secondly because data on experience of friendship were available at all three time-points. For most of the data available in adulthood there were no suitable corresponding measures in childhood. Even so, the definitions in childhood and adulthood were different and the possible influence of this factor needs to be taken into account in interpreting the findings. The definition of '*good friendship*' in childhood was 'has some friends of own'; that of '*limited*' was 'dubious whether has friends'; '*poor*' was 'has no friends of own'. The definitions of 'friendship' at Time 3 were those used in the Overall Composite Score (see p. 237) and were of necessity more complex and clearly defined than those in childhood, since the requirements for an adult friendship, especially in terms of shared interests, reciprocity and mutual responsiveness are greater than those in childhood relationships.

Correlations of PPVT scores and Friendship Ratings were carried out at each time-point to examine the interconnections between language and social relationships. Only those subjects for whom data were available at all three time-points were included in these analyses, except at Time 3 when separate analyses for the incomplete and complete complement of subjects were carried out in order to gauge whether the incomplete set appeared to be atypical. Table 15.8 summarises the findings.

TABLE 15.8

INTERCONNECTIONS BETWEEN LANGUAGE AND SOCIAL RELATIONSHIPS IN THE AUTISM GROUP AT THE THREE TIME-POINTS

	n	r_S	p
Experience of friendship and PPVT			
Time 1	15	0.45	n.s.
Time 2	15	0.48	n.s.
Time 3	15	0.72	< 0.01
Time 3 (full data set)	*19*	*0.75*	*<0.01*

In early childhood there was no significant relationship between language and social relationships. By middle childhood, although it is known from other data that PPVT scores had improved (See Figure 15.6), there was still no significant correlation between the two areas of functioning. There was relatively less change in language functioning between middle childhood and adulthood but at Time 3 a close relationship existed between the two areas. Analysis of the full complement of subjects at Time 3 showed the same strong correlation, indicating that the findings were not due to peculiarities within the sub-set for whom full data were available. In order to look at the relationships between the correlations at the three time-points (the full data-set at Time 3 were not included here) a test of equality of the three correlations was carried out making use of a confirmatory factor analysis model

in the EQS statistical modelling computer package (see Dunn, Everitt and Pickles, 1993). This model predicts the pattern of co-variance in the data that would apply if the null hypothesis were true (i.e. if each of the co-variances were zero). The observed data are then compared with the predicted data and a chi-square test performed. In this case there were found to be highly significant differences between the correlations ($x^2 = 8.27$; *d.f.* = 2; p = *0.02*), and therefore it can be concluded that the relationship between language and social functioning did appear to change over time.

Next it was decided to investigate whether there was any relationship between the patterns of change in the two domains, e.g. did those whose language functioning improved with time show an improvement in social relationships? This analysis was first carried out using PPVT standard scores as the language measures[5]. So few subjects were found to have changed rank substantially, however, that it was difficult to examine the relationship between changes in one domain and changes in the other. It was therefore decided to look at language functioning in another way and so a similar analysis was carried out using the Language Composite Score as the language measure. This too revealed that the majority of subjects did not change rank in either domain, but is the chosen method for presentation here in order to be compatible with the chapter that follows, where a greater change was shown by using this second method. A summary of the findings is given in Table 15.9. It is worth noting, however, that amongst those individuals whose language functioning had improved (*n=6*), 1 showed an improvement in social functioning rank, 4 stayed the same and 1 deteriorated in rank. There was no clear evidence from this examination to indicate that changes in social relationships were related to changes in language functioning in the autism group.

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[5] The definition of language 'improvement' was an increase of more than 1 S.D. in the PPVT standard scores between Times 1 and 3; 'deterioration' was a decrease of more than 1 S.D. and 'unchanged' referred to changes smaller than 1 S.D. in either direction. Changes in friendship rating were defined as movements between the ratings 'good', 'limited' and 'poor' as defined above, over time.

TABLE 15.9

A SUMMARY OF CHANGES IN LANGUAGE COMPOSITE SCORE AND FRIENDSHIP RATING BETWEEN TIMES 1 AND 3 IN THE AUTISM GROUP

	Friendship rating			
	Improvement	Unchanged	Deterioration	Totals
Language Composite Score				
Improvement	1	4	1	*6 (31.6%)*
Unchanged	-	12	1	*13 (68.4%)*
Deterioration	-	-	-	*- (0%)*
Totals	*1 (5.3%)*	*16 (84.2%)*	*2 (10.5%)*	

The broad description of patterns of change given above did not take account of the degree of change (e.g. change from poor-good is greater than from poor-limited), and so in order to quantify this, change scores were used. Each subject was given a change score for Friendship Rating. This was '0' if the rating remained unchanged, '1' for a change of one rating stage (e.g. limited - good) and '2' for any change involving two rating stages (e.g. poor - good). The change scores were given positive values where there was an 'improvement' and negative values where there was a 'deterioration'. The change scores were then totalled separately for the group whose language had improved, and for those whose language had remained the same, and the means were calculated. The mean social relationships change score was 0 in the group whose language had improved and for the other group the mean deterioration was slightly less at -0.08. Since there was very little difference between the two group there is very little evidence within these data either to suggest that changes in language functioning were related to changes in social relationships within the autism group.

OUTCOME PREDICTORS

Lastly, the question of what predicts outcome in autism was addressed. Three different measures of outcome were selected: - Overall Composite Score; Friendship Rating and Language Composite Score. Next, 3 predictor variables were identified and correlations carried out to ensure that they were not highly correlated with one another, which would have caused the results from the multiple regression analysis to be unreliable. The variables that were chosen were PPVT standard score at Time 1, Performance IQ at Time 1 (WISC/Merrill-Palmer data) and Friendship rating at Time 1. This choice was made because there were complete data[6] for these particular variables and because they contributed data from the domains of language, non-verbal functioning and sociability. The correlation matrix for these variables is shown overleaf in Table 15.10.

TABLE 15.10

CORRELATION MATRIX FOR PREDICTOR VARIABLES

	PPVT standard score - Time 1	Performance IQ - Time 1	Friendship rating
PPVT standard score - Time 1	-	.126	-.479
Performance IQ - Time 1		-	-.198
Friendship rating - Time 1			-

[6]In order that the 2 subjects who had been untestable on the PPVT at Time 1 should not be omitted from this analysis they were estimated to have a standard score of 14. It is known that they had very poor verbal abilities at this time and 14 was the lowest score amongst the testable group.

The predictive capacity of these 3 variables was then assessed for each of the outcome variables in turn, by means of the backwards regression procedure. In this technique variables in the block are considered for removal and at each step the variable with the F corresponding to the largest *p* value is removed. The results of the regression analyses for the 3 separate measures of outcome are summarized in Table 15.11. For each outcome variable only 1 of the predictor variables under examination is included since the other variables did not make substantial contributions to the regressions. Details of these are given in the text below.

TABLE 15.11

REGRESSION ANALYSIS RESULTS FOR OUTCOME PREDICTORS IN AUTISM

	Beta	t	p
Overall Composite Score			
PPVT at Time 1	-.56	-2.82	.01
F= 7.97 d.f. = 1,17 p = 0.01 R^2 *= .32*			
Friendship Rating			
Friendship Rating Time 1	.63	3.3	.004
F=11.17 d.f. = 1,17 p = .004 R^2 *= .40*			
Language Composite Score			
PPVT Time 1	-.68	-3.8	.001
F=14.3 d.f. = 1,17 p = .001 R^2 *= .46*			

The multiple regression analysis showed that the PPVT standard score contributed to 32% of the variability in the Overall Composite Score. The variables eliminated in this backwards regression analysis and therefore not included in Table 15.11 were Friendship Rating at Time 1 and WISC Performance IQ at Time 1, contributing 6% and 3% respectively to the overall

variability. PPVT scores at Time 1 also made a highly significant contribution to the adult Language Composite Score with 46% of the variability. Friendship Rating at Time 1 only made a contribution of 5% to this outcome variable and Performance IQ contributed 7%. Friendship Rating at Time 1 was highly predictive of Friendship Rating at Time 3 making a contribution of 40% to the variability. Performance IQ at Time 1 accounted for only 2% of this variability and PPVT standard score at Time 1 only 8%. These results largely confirm what has been found in other studies of outcome in autism, i.e. that language abilities in childhood are highly predictive of outcome in adulthood. It is no surprise to find that social levels in childhood should predict social levels in adulthood since the data above showed that the majority of the group showed no change in Friendship Rating over time. It is of interest to note, however, that in this analysis the PPVT standard score in childhood contributed only 8% to the variability of Friendship Ratings in adulthood. This is yet further evidence that language and social functioning do not have very close interconnections in the autism group.

CONCLUSIONS

In conclusion, this group of autistic subjects was originally selected because of their normal levels of non-verbal functioning. Although there was a mean drop of 11 Wechsler performance IQ points between childhood and adulthood, the mean score on the Raven's Progressive Matrices at Time 3 was 97.7, and so the initial aim of examining subjects of normal intellectual ability could be largely said to have been met in the current study. Nevertheless, despite having relatively normal non-verbal functioning this group was found to have continuing handicaps in language, communication, social relationships, scholastic achievement, daily living skills, employability and socio-emotional expressiveness, and the majority were rated as having 'considerable difficulties' on the measure of overall functioning. Even amongst those subjects who had a good outcome in terms of language and communication, and who did not meet the full social and communicative criteria for abnormal functioning on the ADOS algorithm, there were indications that they found it difficult to relate

to others, evidenced in particular by their lack of sexual relationships. Using these criteria it would not be possible to say that any had made a complete recovery. It is difficult to reach a definite conclusion on the issue of whether there was a genuine reduction in performance IQ between childhood and adulthood. If it were possible to show that the decline was indeed 'real' then this would serve as evidence that the deficit in autism *is* broader than language alone. As things stand at present the issue of IQ change must remain somewhat inconclusive. Language functioning at Time 1 was found to be predictive of overall outcome in early adult life providing further evidence of the centrality of language within the disorder. Nonetheless there was little evidence of changes in language functioning being associated with changes in social functioning to any consistent degree, and this finding together with the widespread impairments described above are indications that autism may well constitute a pervasive developmental disorder.

CHAPTER SIXTEEN: WHAT IS THE ASSOCIATION BETWEEN DEVELOPMENTAL LANGUAGE DISORDER AND SOCIO-BEHAVIOURAL /EDUCATIONAL PROBLEMS?

In many ways the issue under examination here is similar to that raised in the previous chapter in relation to autism. It concerns the nature of the relationship between the language deficit that is believed to constitute a fundamental deficit within the disorder, and functioning in other areas whose role in the disorder is less certain. Thus what is needed first is to examine adult outcome to determine whether the findings of the study confirm those made by other studies, i.e. that there *are* high rates of social, behavioural and educational problems when language-disordered children are followed up into adulthood. The difficulties in finding a homogeneous group have already been discussed and therefore the extent of the variability within this particular group needs to be given consideration at this point. Once it has been established what the outcome in adult life is, then the relationships between language and social relationships, and the patterns of change over time can be examined. An analysis of changes in cognitive functioning over time is also necessary here since any indications that the disorder may be broader than language alone are relevant in discussing associated deficits. Likewise, looking for predictors of outcome from childhood provides valuable information about the relationships between language and other domains.

IS THERE EVIDENCE OF SOCIO-BEHAVIOURAL/EDUCATIONAL PROBLEMS IN ADULT LIFE?

There was widespread evidence amongst the DLD group to confirm the findings made by previous studies. Difficulties were present in a number of different domains so that for many individuals the ability to have normal relationships and hold down a job was impaired. Scores on the Vineland Adaptive Behaviour Scales showed that in the area of social functioning the level of the group overall was well below their chronological age. More

specifically, over half the group showed difficulties in making acquaintances. Likewise, in the area of friendship there were deficits, with only about a quarter of the group having any experience of friendships that might be termed 'normal'. This left the majority of the group with either limited or absent social relationships. Four members of the group had married and 2 had experienced a close relationship with a girlfriend, but the majority had not ever had a close sexual relationship. Nonetheless, despite their shortage of close social relationships there was very little expression of loneliness. Another area in which some subjects showed odd or immature functioning was in their use of leisure time so that there were individuals in the group who had interests that preoccupied them to the extent of interfering with family life, and there were others who found it hard to organise their time constructively. Similarly, a high percentage of the DLD subjects had an immature or literal sense of humour. Other problems in the area of social functioning were highlighted in Chapter Fourteen, where it was apparent that deficits in pragmatic competence, and in socio-emotional expression and understanding were common.

In the arena of educational attainments and qualifications there was considerable evidence of continuing difficulties. Two of the group had obtained a City and Guilds qualification, but none of the others had successfully completed any further education, nor passed any formal examinations. The results of the tests of reading, spelling and arithmetic showed that the majority of the group were performing at levels substantially below what would be normal for their chronological ages. Almost 70% had Composite Age Equivalents below 12 years.

Whilst the majority of the group were able to carry out a range of self-care and everyday activities without help, a third were rated as having less than full independence and needed help with certain tasks (e.g. managing finances; purchasing major items; some aspects of self-care). Another point of note was that over half the group were still, in their twenties, living at home with their parents. Most of them were in employment, but about two-thirds of these had irregular work records with either long periods out of work or in a series of temporary jobs. About a-third of the subjects had experienced problems at work or in their

day programs and in some cases these were serious enough to affect their ability to hold down a job or retain a place at a day centre.

Two individuals had unusual preoccupations as mentioned above, and although there were no other definite examples of quasi-obsessive or ritualistic behaviours, several were unusually routinized or showed unusually negative reactions to change. With regard to more general behaviours, 70% showed either severe or intermediate levels of maladaptive behaviours on the Vineland Scales.

The Overall Composite Score was introduced in the previous chapter and Table 16.1 below shows how the DLD group were rated on this variable. It can be seen that only a quarter of the group were classified as having 'near normal' functioning' and although this is a higher proportion than was seen in the autism group it indicates, nevertheless, substantial impairments in adulthood.

TABLE 16.1

OVERALL COMPOSITE SCORES IN DLD GROUP

Level of functioning on 'Overall Composite Score'	n
Near normal	5 *(25%)*
Moderate	13 *(65%)*
Considerable difficulties	2 *(10%)*
TOTAL SUBJECTS	20

An indication of what these levels of functioning meant in practice can be obtained by reading the vignettes in Appendix VII. Subjects DLD4, DLD18, DLD20, DLD22 and DLD23 made up the 'near normal' group. DLD1 and DLD10 were rated as having 'considerable difficulties', whilst the remainder of the subjects were described as having 'moderate' functioning.

As with the autism group an analysis was carried out to see how many different areas of 'impairment' each individual had. These findings are summarised in Table 16.2.

TABLE 16.2

RANGE OF IMPAIRMENT IN THE DLD GROUP

	n
'Impairment' in all 4 areas	3 (15%)
'Impairment' in 3 areas	4 (20%)
'Impairment' in 2 areas	7 (35%)
'Impairment' in 1 area	3 (15%)
No 'impairment' in any of the 4 areas	3 (15%)
TOTAL SUBJECTS	20

Table 16.2 shows that similar numbers of subjects showed impairment in 4 or 3 areas as showed impairment in 1 or none of the areas. The mean number of 'impaired areas' in the group was 2.1.

IS THERE EVIDENCE OF IMPAIRMENT IN THOSE WITH 'GOOD LANGUAGE' SKILLS?

The extent of the variability in the group seemed to be much less than that found in the autism group. Thus the standard deviation of the PPVT raw score was half that found in the autism group, and the standard deviation of the WAIS verbal scale was, at 7.8, a third that in the autism group. Similarly in terms of level of spoken language the group were much more homogeneous with 75% making largely correct use of sentences and 25% with immature grammar, but none worse than this.

This simple breakdown by 'level of spoken language', however, did not take into account the ability of the subjects to use language in a social situation. The Language Composite Score did provide a measure of this, since one of the items comprised within in it is 'ability to talk with others so that conversation flows and builds on the other person's dialogue'. It appeared to be mainly this component of the composite score (the others were 'using sentences with mature grammar' and 'understanding 2-3 step instructions') that resulted in 25% of the group having a 'poor' or 'very poor' rating. A summary of the breakdown of ratings for the Language Composite Score is given in Table 16.3

TABLE 16.3

LANGUAGE COMPOSITE SCORES IN THE DLD GROUP

Level of functioning on 'Language Composite Score'	n
Good	7 (*35%*)
Fair	8 (*40%*)
Poor	3 (*15%*)
Very poor	2 (*10%*)
TOTAL SUBJECTS	20

The question that needs to be asked here is whether the 'good language' group could be described as having made a complete recovery and so the data for these 7 subjects were examined in more detail. For the sake of consistency the subjects are given the same identifying labels here as in Appendices VI - VIII, the tables that display their psychometric test results at the three time-points.[1] Based on the informant data none of them showed any clear-cut evidence of deviant language, although 2 (Subjects O and S) had minor prosodic

[1] Subjects from the autism group were given lower case labels and those from the DLD group, upper case labels.

oddities and there were 2 cases with slightly reduced levels of vocal expressiveness (Subject O again, and Subject P). Table 16.4 summarises their educational attainment levels for reading accuracy, reading comprehension and spelling, as well as giving their verbal IQ's, and Table 16.3 provides a summary of whether they had any sexual relationships and friendships, whether they were working and whether they had experienced any work-related problems, currently, or in the past. Test results were not available for Subject R who declined contact, but informant-based data were available and are given in Table 16.5.

TABLE 16.4

ATTAINMENT LEVELS OF DLD SUBJECTS WITH GOOD LANGUAGE

		ATTAINMENT AGE EQUIVALENTS		
	Verbal IQ	Reading Accuracy*	Reading Comprehension**	Spelling***
Subject E	73	10y 0m	11y 7m	11y 6m
Subject L	88	15y 9m	12y 2m	10y 8m
Subject O	79	7y 2m	8y 8m	8y 7m
Subject P	78	6y 11m	9y 4m	8y 1m
Subject Q	82	17y 0m	15y 11m	8y 7m
Subject R	-	-	-	-
Subject S	81	17y 0m	14y 2m	9y 11m

**Ceiling score = 17 years; ** Ceiling score = 16 years; ***Ceiling score = 15 years*

These results demonstrate that even the subjects who had the best outcome in terms of language showed considerable evidence of educational delays in adulthood. Subjects E, O and P were relatively impaired in all three areas; Subjects Q and S were reading at the ceiling levels of the accuracy and comprehension tests, but had poor spelling, and Subject L, although quite good on reading accuracy was somewhat impaired on reading comprehension

and spelling. It would be ideal if there were a satisfactory way to interpret these findings whilst taking chronological age and verbal IQ into account. There do not appear to be any data, using these tests, however, which allow this to be done satisfactorily. All the subjects in this group had verbal IQ's above 70 which is the usually accepted cut-off point for a definition of intellectual retardation (Rutter, Tizard and Whitmore; 1970), and whilst there is enormous variation in the expected levels of achievement in a group such as this (Howlin, 1994), it seems likely that at least some of the subjects were experiencing educational delays greater than might be expected on the basis of their IQ data alone.

TABLE 16.5

A SUMMARY OF ASPECTS OF SOCIAL FUNCTIONING AND EMPLOYMENT IN DLD SUBJECTS WITH GOOD LANGUAGE

	Has friends	Has sexual relationships	Currently employed	Without any history of work-related difficulties
Subject E	Yes	Yes	Yes	Yes
Subject L	Yes	Yes	Yes	Yes
Subject O	No	No	No	No
Subject P	No	No	Yes	Yes
Subject Q	No	Yes	Yes	Yes
Subject R	Yes	Yes	Yes	Yes
Subject S	Yes	No	Yes	Yes

In terms of relationships, 3 were married and living entirely independently (L, Q & R). Another (E) had experienced a number of apparently normal relationships with girlfriends and seemed to have several friends. These 4 individuals who were the ones with the best social outcome were all in employment and had not experienced any major difficulties in the workplace. Two had changed jobs a number of times (E & Q), but it is difficult to know

whether this represented a deviation from normality since there are no normative data with which to compare it. Of the remaining 3 subjects with 'good language', 1 (S) had friends but no close sexual relationships, and the other 2 (O & P) had neither close friendships nor sexual relationships. Subject O was living on his own but still had a great deal of support from his parents. He could not hold down a regular job as he found it hard to cope with the demands of employment (e.g. he was sacked from a previous job for not working fast enough, and in a job on a chicken farm he had been in trouble for accidentally breaking eggs). He had a part-time voluntary job and spent a lot of his time wandering around the town looking at the traffic. The other 2 subjects were both living with their parents and holding down jobs with no apparent difficulties. All 7 subjects rated as having 'good' language had 'adequate' levels of independence on the Vineland Scales.

Although data on other aspects of social functioning were available, examination revealed only a few instances of oddities or problems in other areas. Two subjects (O and Q) were reported to have a literal sense of humour and Subject O was also said to be slightly disinhibited and embarrassing at times; as was Subject P. Results from the socio-emotional tasks were available for 4 of these subjects and there were indications of impairment here. Subjects E, L and O all had Socio-Emotional Composite Scores more than 3 standard deviations below the mean when compared with the control subjects in Macdonald et al's (1989) research. The score for P, however, was close to the normal group mean.

The findings on outcome in the 'good language' group were therefore rather mixed. Several subjects were living normal lives when measured in terms of employment, independence and relationships. Others showed evidence of continuing problems in these areas and when attainment levels and the results of socio-emotion tasks were taken into account it seemed that there were indications of at least some problems in the majority of this group.

CHANGES IN COGNITIVE FUNCTIONING OVER TIME

As with the autism group it was informative to examine patterns of cognitive functioning. Three subjects had missing WISC Verbal IQ's at Time 1, and as with the autism group, decisions about the reasons for their missing data were made on an individual basis and estimated scores allocated. It was notable that these 3 subjects were found to be the youngest members of the group at Time 1, and this was taken into account as it may have affected their co-operativeness in the test situation. One achieved the highest rank on the PPVT and he was allocated a verbal IQ at the mean of the group for whom results were available. The remaining two subjects were ranked joint 18th out of 20 on the PPVT and were amongst the lowest ranks on the Reynell Comprehension Scale. The general impression, however, from looking at other data, was that they were not as difficult to test as some members of the autism group had been, and on the basis of clinical judgement they were therefore allocated scores at the bottom of the verbal IQ range for the group (i.e. 60). Scores were available for all subjects at Time 3, except one. No test results were available for him as he declined contact. In his case it was not felt possible to allocate a score with any degree of accuracy and so the data on changes in cognitive functioning relate to 19 subjects. Performance IQ's were available for all these 19 subjects at both Times 1 and 3, and for a total of 10 at all three time-points.

Taking performance IQ first, and examining the data in the more complete group, there was a decrease of more than 10 points between Times 1 and 3 (*means = 88.9 vs. 78.4 at Times 1 vs. 3, S.D.'s = 2.1 vs. 2.4*) , with the IQ's at Time 1 being statistically significantly higher than those at Time 3 ($t = -6.26$, $d.f. = 18$, $p < 0.001$). As with the autism group , however, it is not possible to be clear how far this decrease is 'real' and how much it is due to the different forms of test used.

FIGURE 16.1

INDIVIDUAL CHANGES IN PERFORMANCE IQ FROM TIME 1 TO TIME 3 IN THE DLD GROUP

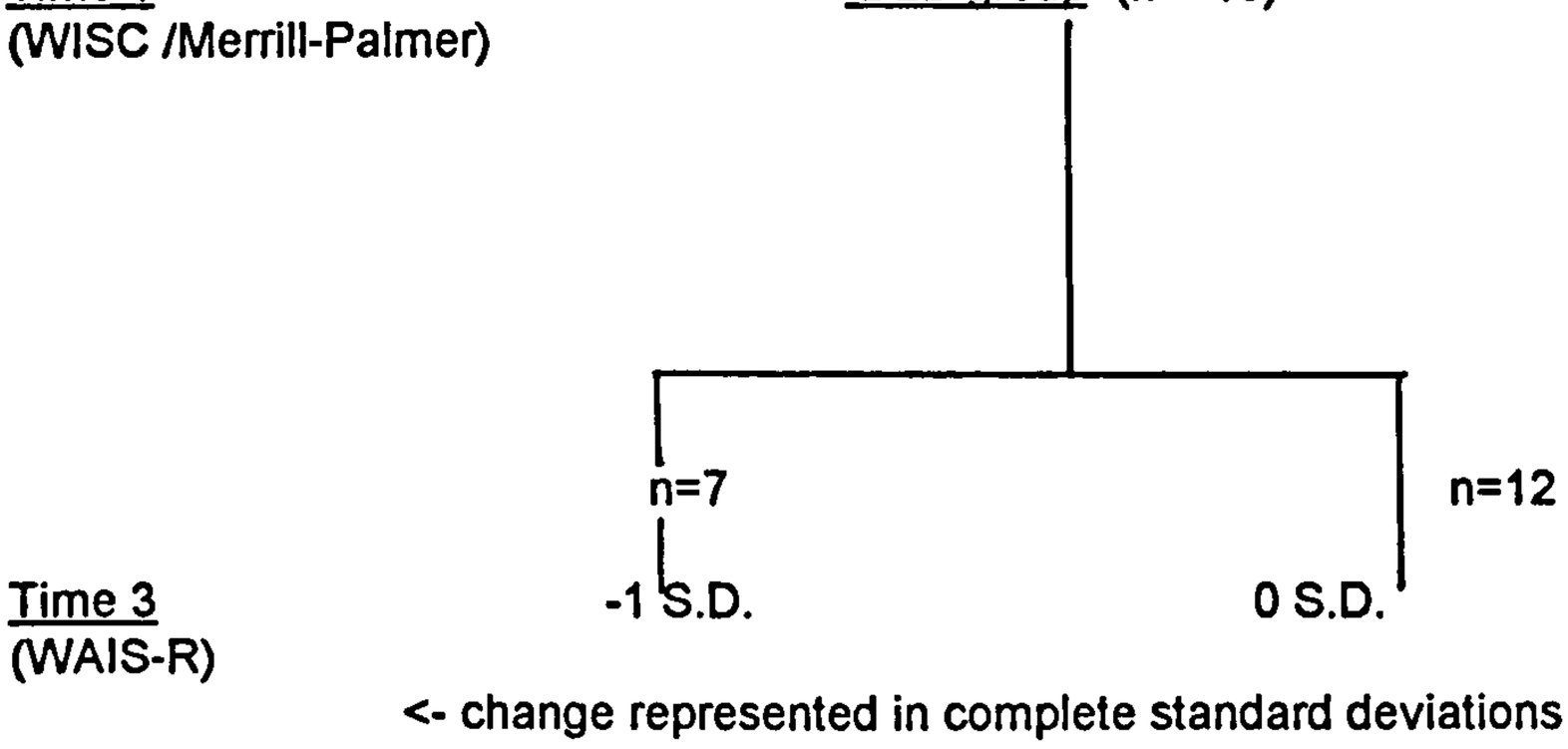


Figure 16.1, above, provides a more detailed analysis of the change in performance IQ and shows how that of the individual members of the group differed at Times 1 and 3. This change is represented as the IQ difference, in complete standard deviations, between the two time-points. It is clear from Figure 16.1 that more than a third of the group showed a change of at least 1 standard deviation at Time 3 and that for all these there was a reduction in performance IQ. The pattern of change in those three subjects with the best outcome (i.e. no impairment in any of the 4 areas in Table 16.2) was examined. Two showed a 'decrease' of less than 5 points and 1 a 'decrease' of 10 points between childhood and adulthood. Again the evidence here is rather mixed and since there were other individuals who also showed a small decrease, or none at all, but who did not have such a good outcome it is difficult to say whether the findings on patterns of change in cognitive functioning constitute evidence that these subjects are a diagnostic sub-group.

Next the data for the 10 individuals with performance IQ's at all three time-points were examined.

FIGURE 16.2

MEAN PERFORMANCE IQ'S IN DLD GROUP AT TIMES 1, 2 AND 3

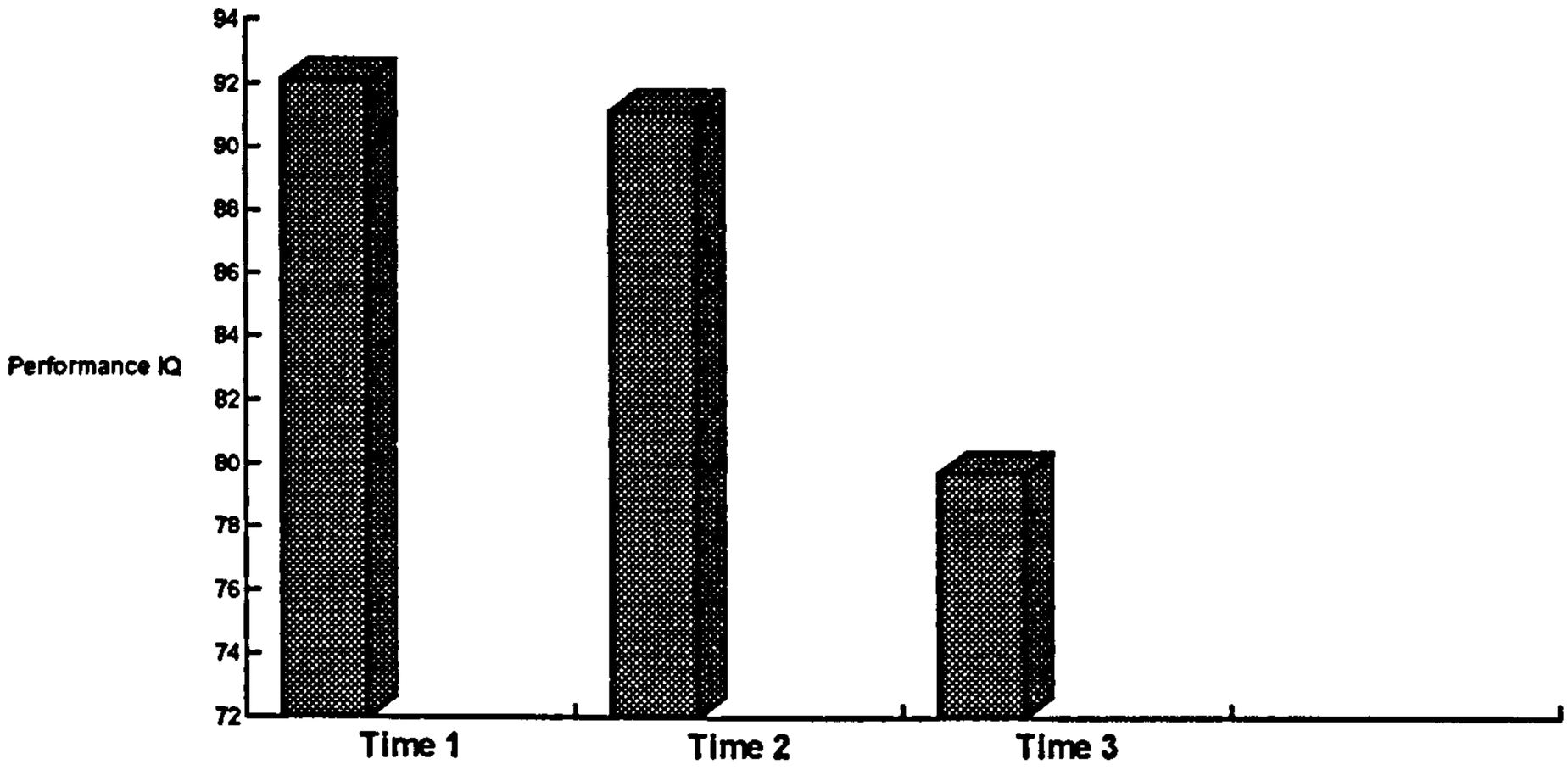


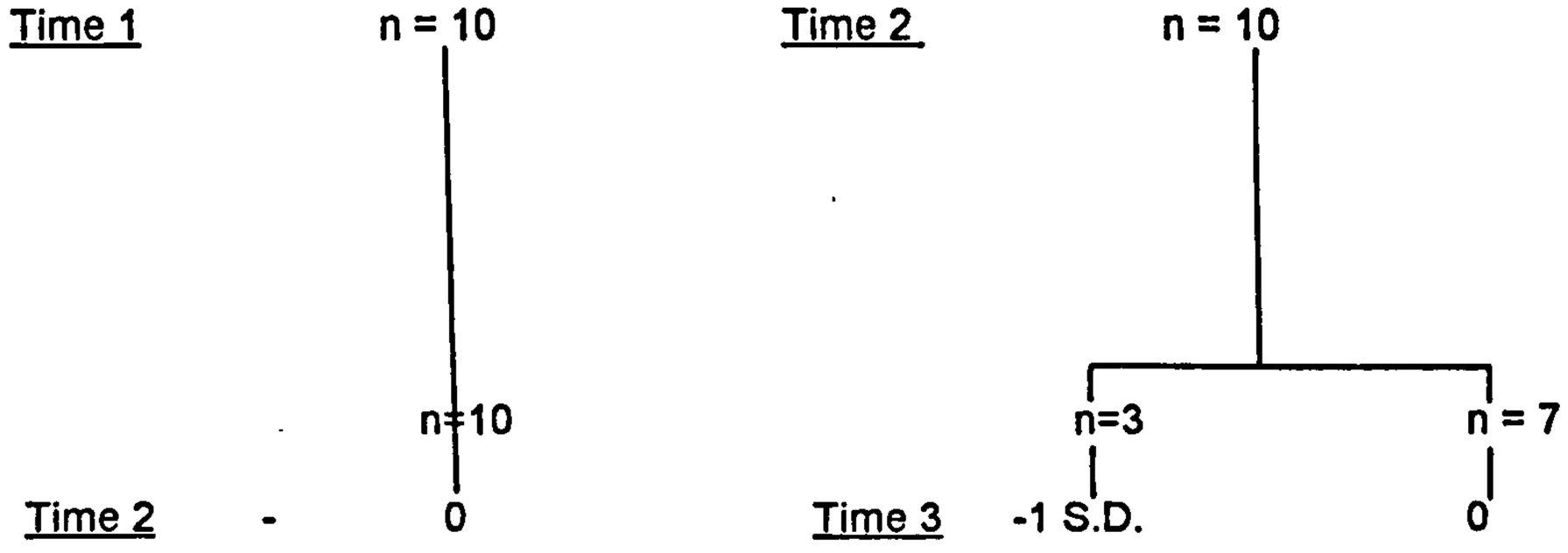
Figure 16.2 shows that the mean scores at Times 1 and 2 were very similar (*92.0, S.D. = 10.1 at Time 1 vs 91.1, S.D. =14.2 at Time 2*). The mean at Time 3 was somewhat lower at 79.7 (*S.D. = 11.3*).

Analysis of the individual changes between Times 1 and 2 and Times 2 and 3 revealed that between early and middle childhood no subjects changed their IQ scores by more than 1 standard deviation. A few showed a decrease as big as this between middle childhood and adulthood but the majority stayed *within* 1 standard deviation. These results are displayed in Figure 16.3.

FIGURE 16.3

INDIVIDUAL CHANGES IN PERFORMANCE IQ IN THE DLD GROUP

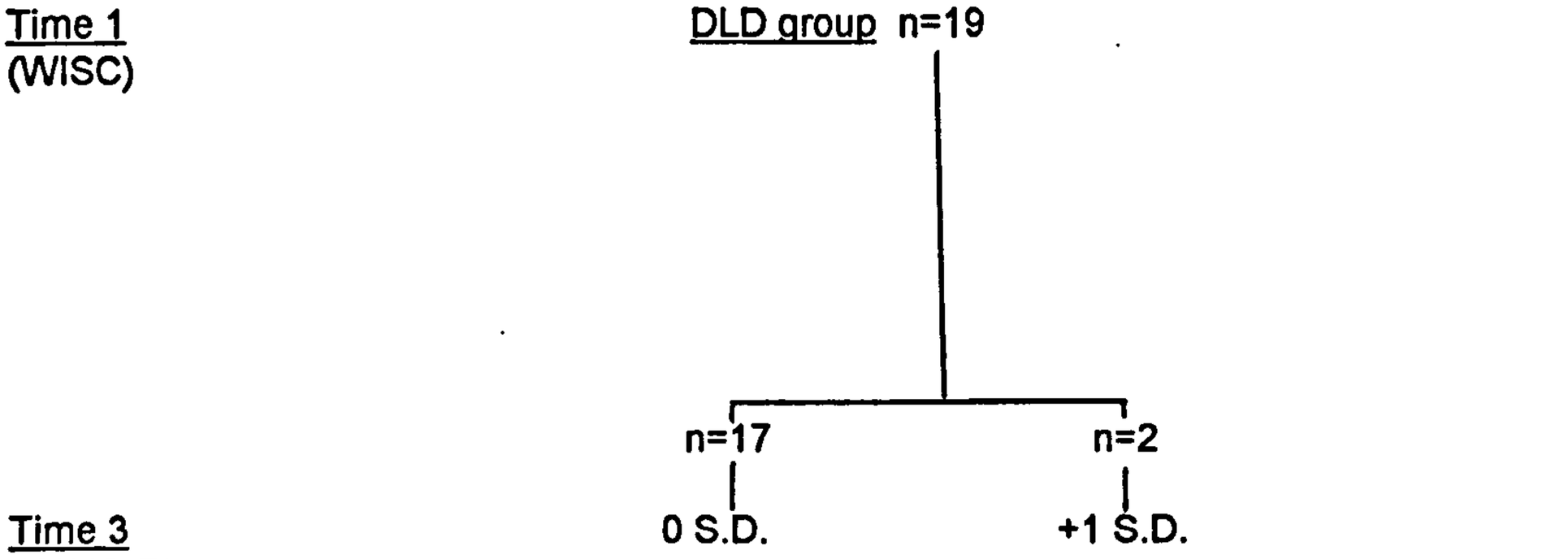
BETWEEN TIMES 1 AND 2, AND BETWEEN TIMES 2 AND 3



Analysis of verbal functioning over time revealed a lesser degree of change. Using the newly-incorporated estimated data there was found to be little difference in the means at the two time-points (*means = 74.0 vs 75.3, S.D.'s = 11.4 vs 7.8, Time 1 vs Time 3*). The mean increase over time was 0.95 points (*S.D. = 9.4*). Examination of individual scores showed that many subjects showed a decrease in scores and many an increase with the net result being a very small mean change. Figure 16.4 below shows the pattern of change in individual subjects with the change being represented in complete standard deviations.

FIGURE 16.4

INDIVIDUAL CHANGES IN VERBAL IQ FROM TIME 1 TO TIME 3 IN THE DLD GROUP



For none of the subjects where there was a decrease in verbal IQ was this change as great as 1 standard deviation. Two subjects on the other hand had an increase that was greater than 1 standard deviation. Neither of these were amongst those individuals who had estimated scores at Time 1.

As with the autism group the results for the PPVT were examined at all 3 time-points. Data were only available for 10 subjects, the loss mainly occurring at Time 2. These findings are summarised in Table 16.6, below.

TABLE 16.6

A SUMMARY OF PPVT RESULTS IN THE DLD GROUP AT TIMES 1,2 AND 3

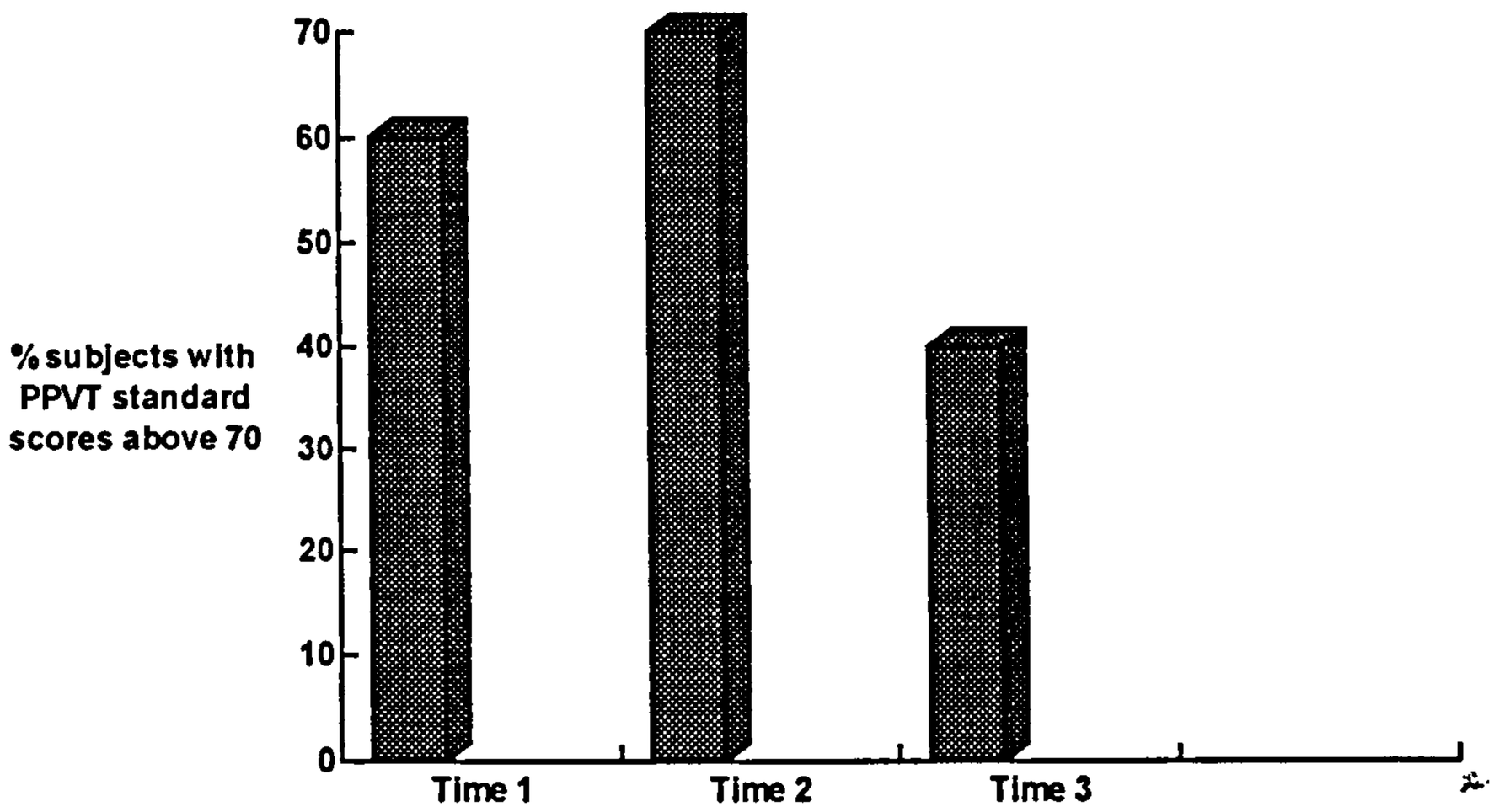
	n	Std score above 70	Mean std score	*S.D.*
Time 1	10	6 (*60%*)	77.8	*12.7*
Time 2	10	7 (*70%*)	76.3	*14.9*
Time 3	10	4 (*40%*)	63.21	*18.2*

It can be seen from Figure 16.4, below, that this group achieved their highest overall scores at Time 2 when 7 subjects (*70%*) achieved standard scores above 70. The highest percentage of poor scores was at Time 3 when only 4 subjects (*40%*) scored above 70. At Time 1 there were 6 members of the group (*60%*) who did so. The mean standard score at Time 1 was 77.8 (*S.D. = 12.7*). At Time 2 the mean showed very little change (*76.3; S.D. = 14.9*). The mean at Time 3 was somewhat lower at 63.2 (*S.D. = 18.2*). Since there were no members of this group with complete data who scored below the basal level of 19, this calculation was not subject to the same problems that arose in the autism group, and can be taken as being an accurate assessment of the mean standard score. Analysis of variance with the time-points as the independent variables revealed there to be significant differences between the standard scores at the different stages of development ($F = 5.4$; $d.f. = 2, 18$; $p < 0.02$).

Figure 16.5 shows more graphically how the percentage of subjects with a standard score above 70 changed with time.

FIGURE 16.5

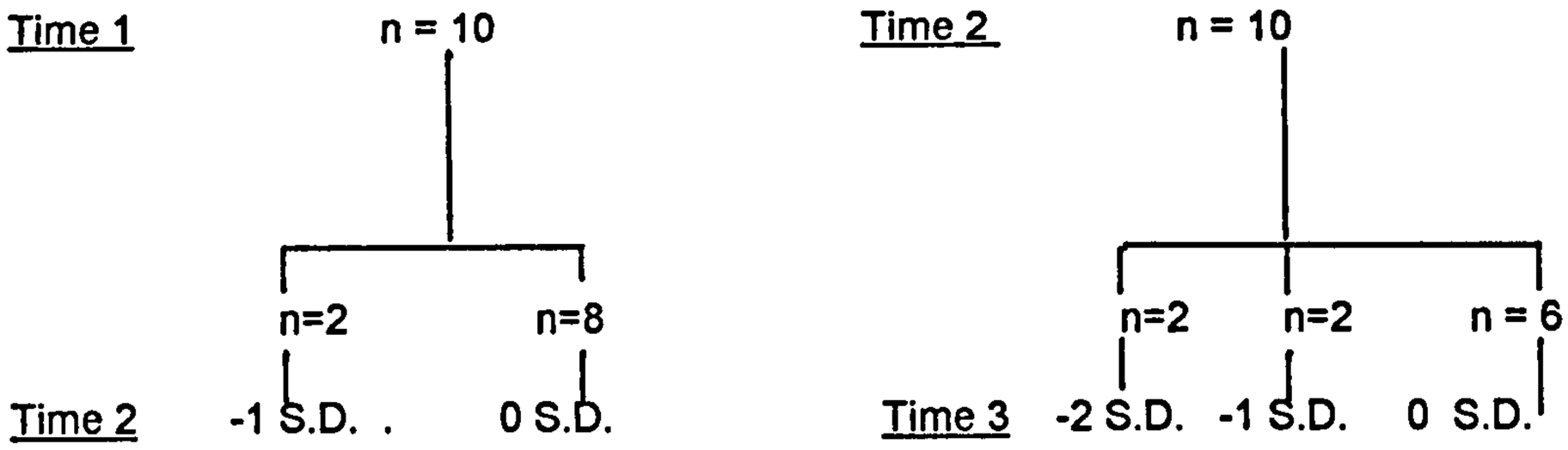
PEABODY PICTURE VOCABULARY TEST RESULTS IN THE DLD GROUP AT TIMES 1, 2 AND 3.



A more detailed picture of changes in PPVT standard scores is given below in Figure 16.6. This shows how the individuals in the group changed between Times 1 and 2, and between Times 2 and 3. Each time, the change is represented as the standard score difference, in complete standard deviations, between the two time-points in question.

FIGURE 16.6

INDIVIDUAL CHANGES IN PPVT STANDARD SCORE BETWEEN TIMES 1 AND 2, AND 2 AND 3 IN THE DLD GROUP.



Between early and middle childhood the majority of the DLD group stayed within 1 standard deviation of their original scores, but for the 2 members who did show changes of at least 1 standard deviation these were in a negative direction. Between middle childhood and adulthood, also, the tendency was for changes to be in a negative direction.

THE RELATIONS BETWEEN VERBAL AND NON-VERBAL FUNCTIONING

The results in Chapter 5 have already shown that at Time 1 the scores on the verbal scale were lower than on the Performance scale. In order to take into account the estimated verbal IQ scores included here, these data were re-analysed and showed a mean difference of 14.7 IQ points (*S.D = 12.0*) between the verbal and performance scales. It is difficult to comment on the significance of this difference since the WISC manual does not provide standard error data, but simple inspection shows that the difference is noteworthy. As

described in Chapter 15, however, the WISC-R manual *does* provides data, and indicates that in the age range of 7.5-8.5 years a difference of 11.9 points would be considered significant at the 5% level. These particular data do come from a different version of the test, but it seems likely, even so, that a difference of 14.7 points is significant. The next question was whether this pattern of difference continued in adulthood. Analysis of the adult data using the complete range of subtests has shown that the difference in scores between the two scales was 3.2 IQ points (S.D. = 9.2). This was clearly a much smaller difference and was not a significant one (Wechsler, 1981).

As with the autism group those subjects who had increased in verbal IQ between Times 1 and 3 by at least 1 S.D. were examined in more detail to see what had happened to their performance IQ's. There were 2 subjects who showed a substantial increase in verbal IQ; one showed an apparent increase of 22 IQ points, and the other an increase of 21 points. The performance IQ of the former subject was two points lower at follow-up than at Time 1 and the latter subject showed an apparent decrease of 8 points.

INTERCONNECTIONS BETWEEN LANGUAGE AND SOCIAL RELATIONSHIPS

The question of how social relationships varied according to changes in linguistic ability was addressed next. The interconnections between these two areas of functioning have already been discussed in the autism group and a similar approach was taken with the DLD group. A series of correlations looking at the relationship between PPVT scores and Friendship Ratings at each time-point were carried out. The results are summarized in Table 16.7. Only subjects for whom there were complete data were included in these analyses, except at Time 3 where the analysis was carried out for both the incomplete and almost complete (with 1 subject missing) data sets.

TABLE 16.7

INTERCONNECTIONS BETWEEN LANGUAGE AND SOCIAL RELATIONSHIPS IN THE DLD GROUP AT THE THREE TIME-POINTS

	n	r_s	p
Experience of friendship and PPVT			
Time 1	10	0.63	<0.05
Time 2	10	0.35	n.s.
Time 3	10	0.11	n.s.
Time 3 (full data set)	19	0.36	n.s.

These data showed that initially, in early childhood, there was a significant association between language and social relationships. No evidence of a close relationship was found, however, in middle childhood, nor in adulthood for either the complete or partial data sets. There was a drop in correlation between Times 1 and 3 for the DLD group whereas in the autism group the change was in the opposite direction. As with the autism data in Chapter 15, a test of equality of the three correlations was carried out making use of a confirmatory factor analysis model in EQS (Dunn et al., 1993). This showed no evidence of any significant differences between the correlations ($x^2 = .77$; *d.f.* = 2; $p = 0.68$) and therefore indicated that the relationship between language and social functioning did not show any marked change over time. It should be noted, however, that the levels of significance here are inevitably influenced by the small sample size.

Next, the patterns of change in the two domains were investigated and as with the autism group the major question was whether those whose language functioning improved with time

showed an increase in social relationships. Table 16.8 summarises the changes in Friendship Ratings and Language Composite Scores that took place between Times 1 and 3. As in Chapter 15 the definition of language 'improvement' was an increase of more than 1 S.D. in the PPVT standard scores between Times 1 and 3; 'deterioration' was a decrease of more than 1 S.D. and 'unchanged' referred to changes smaller than 1 S.D. in either direction. Changes in Friendship Rating were defined as movements between the ratings 'good', 'limited' and 'poor' as defined earlier, over time.

TABLE 16.8

A SUMMARY OF CHANGES IN PPVT STANDARD SCORE AND FRIENDSHIP RATING BETWEEN TIMES 1 AND 3 IN THE DLD GROUP

	Friendship rating			
	Improvement	Unchanged	Deterioration	Totals
PPVT standard score				
Improvement	-		-	- (*0%*)
Unchanged	-	5	10	15 (*78.9%*)
Deterioration	-	-	4	4 (*21.1%*)
Totals	- (*0%*)	5 (*26.3%*)	14 (*73.7%*)	

Using the PPVT standard score as the measure of language functioning so few individuals were found to have changed rank that it was decided to look at language functioning in another way, and so a similar analysis was carried out using the Language Composite Score at Time 3 as the language measure. The findings are summarized in Table 16.9, below. This demonstrated clearly that although 13 subjects had improved in language functioning, none appeared to have improved in social relationships, indeed the majority had deteriorated. Looking at individual patterns of change, amongst those 13 individuals whose

language rank had improved with time, 7 had shown a deterioration in social relationships rank and 6 had stayed at the same level. All those whose language rank had stayed the same (*n* = 7) had shown a deterioration in social relationships rank. Thus there was no obvious pattern suggesting that changes in language functioning were related to changes in social relationships.

TABLE 16.9

A SUMMARY OF CHANGES IN LANGUAGE COMPOSITE SCORE AND FRIENDSHIP RATING BETWEEN TIMES 1 AND 3 IN THE DLD GROUP

	Friendship rating			
	Improvement	Unchanged	Deterioration	Totals
Language Composite Score				
Improvement	-	6	7	13 (65%)
Unchanged	-	-	7	7 (35%)
Deterioration	-	-	-	- (0%)
Totals	- (0%)	6 (30%)	14 (70%)	

The degree of change (e.g. change from poor-good is greater than from poor-limited) was also investigated as it was with the autism group. The mean social relationships change score was -1.08 in the group whose language had improved and for the other group the mean deterioration was slightly less at -0.86. Since the group whose language had improved showed a greater mean deterioration than those whose language had stayed the same there is very little evidence to suggest that changes in language functioning were related to improvements in social relationships within the DLD group.

FURTHER CONSIDERATION OF THE RELATIONSHIP BETWEEN LANGUAGE AND SOCIAL RELATIONSHIPS[2]

Although the evidence thus far provides little indication that the social difficulties <u>are</u> a secondary result of the language deficits, this issue demands further exploration since there are a number of secondary mechanisms that seem to have inherently plausible explanatory power. One of these concerns the issue of social rejection. It might be supposed that children who had experienced negative relationships would find it harder to form friendships in adulthood and might avoid social contact. Teasing is one measure of social rejection and so an analysis was carried out to investigate whether a history of being teased was associated with social outcome in adulthood. Table 16.10 summarises these findings. Data were missing for 3 members of the group, but of the remainder it was found that 11 subjects had experienced notable levels of teasing in the past, and that of these, 5 (*45%*) had at least some, even limited experience of friendship in adulthood. Of the 6 subjects who had not experienced problematic levels of teasing, however, a higher percentage (*83%; n = 5*) had some experience of friendship in adulthood. The differences between experience of friendship amongst those who had been teased and those who had was not found, however, to be significant on the chi-square test ($x^2 = 1.00$; *d.f. = 1; n.s.*), however.

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[2]N.B. The issues in this section, and in the following section on employment history, were not covered in the previous chapter in relation to autism since so few of the autism group had either friends or employed status that the analysis could only be very limited.

TABLE 16.10

THE RELATIONSHIP BETWEEN PAST TEASING AND CURRENT FRIENDSHIPS IN THE DLD GROUP

	n	n with friends
No significant level of past teasing	6	5 (*83%*)
More than usual amount of teasing in past	11	5 (*45%*)
Not known	3	

Another angle of the social rejection hypothesis concerns the type of school attended. It has been proposed that being in a school where a child stands out as different might make them a target for teasing and social rejection. Bearing this in mind, the relationship between type of school attended and Friendship Score was examined. Thirteen subjects had attended an ordinary school for a period of at least 2 years between the ages of 9 years and school-leaving age. Of these, 5 (*38.5%*), had normal friendships in adulthood. There were 7 in the group who had not attended ordinary schools and none had normal friendships. The finding that those in the special schools did not have friends either, suggests that although ' standing out as different' may play some part in the lack of friendships of the 'ordinary school' group, it presumably cannot account very far for the lack of friendships in the 'special school' group. However, without knowing more about the range of pupils in the special schools it is difficult to draw any definite conclusions here.

Related to the social rejection hypothesis is the idea that language difficulties simply make it harder to form relationships. As individuals get older the role that language plays in helping to create and maintain relationships is likely to be greater and anyone who is hesitant about expressing themselves, is unable to make themselves understood at times, or is unable to keep up with the linguistic productions of others, is likely to be at a disadvantage in forming

friendships. It has already been seen in Chapter Six that whilst the DLD group had made many advances in their language by adulthood, they were still not fully recovered when compared with the general population. Many were also quite immature for their age as was evidenced by the findings on independence, and this would supposedly make it harder for them to be accepted by, and form relationships with other people of their own age. This explanatory mechanism assumes that the social difficulties are a direct result of the language deficits. It appears very plausible, and may have some explanatory value. Nonetheless, these data have failed to show any significant relationship between language and social relationships and so it cannot be accepted as a major explanatory mechanism here.

A second aspect of this issue is that with increasing age the social relationships themselves make greater demands, both in terms of subtlety and the efforts required to maintain them. Once individuals leave school the automatic social structure that they have been part of, from day to day, is removed and they must rely on their own resources and efforts in order to create and maintain relationships. It could be argued that young men who are linguistically disadvantaged might be less able, or less willing, to make these efforts. There is also a suggestion that many of the group who did not have friends had *little desire* for social contact. It is not clear how far they had attempted to be sociable and had their advances rejected, but it seemed likely that they had not sought social contact to any great extent, since of those lacking relationships few expressed any real feelings of loneliness or a desire for friends. There were similarities with the autism group in this respect. Once again there is the problematic issue of teasing out how far the social difficulties can be directly accounted for by difficulties in language. It makes inherent good sense to assume that the language deficits do not *assist* in making friends, but on the other hand there are so few data indicating a causative link between the two areas of deficit that the idea of some sort of social deficit being fundamental within the disorder cannot be ruled out.

Data that can be used to support such an argument came from the observation that there were deficits in areas where it is more difficult and less plausible to argue origins secondary

to the language problems. Thus only a quarter of the group were reported to have a normal sense of humour, with the majority having either a literal sense of humour or only an appreciation of slapstick humour. It is possible that subtle language deficits might account for these findings, but on the other hand they might equally well indicate a deficit in social understanding in some of the group. Also, 6 (*30%*) were reported to be socially disinhibited to the point of embarrassment at times, again seeming to reflect difficulty in appreciating the implications of certain social situations. Moreover, there are the findings relating to the socio-emotion tasks where a high percentage showed abnormality in expression and production. It is unclear exactly how far these tasks can be said to be representative of real life, but again the indications are there of problems in the social arena.

THE RELATIONSHIP BETWEEN EMPLOYMENT HISTORY AND OTHER VARIABLES

Another aspect of adult social functioning where problems were apparent was in the arena of employment. Thirteen individuals (*65%*) had either experienced long periods of unemployment or had a history of brief temporary jobs, and 7 (*35%*) had experienced noteworthy problems at work. Stability of employment history was examined first and a series of analyses were carried out to investigate whether there were any identifiable differences between those subjects who had stable work records and those who did not. The findings are summarized in Table 16.11. The two groups were not found to differ significantly on either the WAIS Verbal IQ, WAIS Performance IQ, Composite Attainment Age, or independence as measured by the Vineland Daily Living Skills standard score. There was, on the other hand, a significant difference between the employment groups when their PPVT standard scores were compared. The mean score in the group with stable work records was significantly higher than that in the group who had more patchy work histories ($t = 2.78$, $d.f. = 17$, $p = 0.01$).

TABLE 16.11

THE RELATIONSHIPS BETWEEN STABILITY OF WORK RECORD AND OTHER VARIABLES IN THE DLD GROUP

	STABLE WORK			NO STABLE WORK					
	n	Mean	*S.D.*	n	Mean	*S.D.*	t	d.f.	p
WAIS Verbal IQ	6	79.8	*6.9*	13	73.2	*7.5*	1.85	17	n.s.
WAIS Performance IQ	6	80.8	*7.4*	13	77.3	*11.7*	0.67	17	n.s.
Composite Attainment Age Equivalent	6	12y7m	*2y1m*	13	9y7m	*2y7m*	1.97	17	n.s.
Vineland Daily Living Skills Standard Score	7	105.9	*10.8*	13	95.6	*16.0*	1.51	18	n.s.
PPVT Standard Score	6	75.5	*6.4*	13	57.8	*18.3*	2.78	17	0.01

Next, a series of analyses were carried out to investigate whether there were any significant differences between those subjects who had experienced notable problems at work and those who had not. These findings are summarized in Table 16.12. The significance levels were fairly low, but it was found that those subjects who had experienced problems tended to have significantly lower verbal IQ's and lower Vineland Daily Living Skills standard scores. There were no significant differences, however, on either performance IQ, PPVT standard score, or Composite Attainment Age.

TABLE 16.12

THE RELATIONSHIPS BETWEEN PROBLEMS AT WORK AND OTHER VARIABLES IN THE DLD GROUP

	NO PROBLEMS			PROBLEMS					
	n	Mean	*S.D.*	n	Mean	*S.D.*	t	d.f.	p
WAIS Verbal IQ	*12*	78.0	*6.5*	*7*	70.6	*8.0*	2.21	17	<0.05
WAIS Performance IQ	*12*	79.4	*8.2*	*7*	76.7	*14.0*	0.53	17	n.s.
Composite Attainment Age Equivalent	*12*	11y3m	*2y8m*	*7*	8y11m	*2y1m*	2.1	17	n.s.
Vineland Daily Living Skills Standard Score	*13*	104.7	*15.4*	*7*	89.0	*7.1*	2.53	18	<0.05
PPVT Standard Score	*12*	68.8	*14.8*	*7*	57.6	*23.1*	1.31	17	n.s.

OUTCOME PREDICTORS

The same multiple regression procedure described in the previous chapter was carried out on the DLD group. Table 16.13 gives the correlation matrix for the three predictor variables used and shows that as there were no significant correlations between them they could safely be entered into the multiple regression analysis.

TABLE 16.13

CORRELATION MATRIX FOR PREDICTOR VARIABLES

	PPVT standard score - Time 1	Performance IQ - Time 1	Friendship Rating
PPVT standard score - Time 1	-	.089	-.276
Performance IQ - Time 1		-	-.284
Friendship Rating - Time 1			-

The outcome variables, Overall Composite Score, Friendship Rating and Language Composite Score were all examined separately in a series of backwards regression analyses using the 3 predictor variables.

None of the predictor variables made substantial contributions to any of the regression equations. Table 16.14 summarizes the findings on the variables that made the most contribution to each outcome measure and it can be seen that in each case this was very small indeed. Once again there was little evidence to support a strong relationship between language and social relationships.

Table 16.14 shows that the predictor variable contributing most to the Overall Composite Score was PPVT at Time 1. Even so the contribution was very small indeed at only 2% of the overall variability. The greatest contribution to Friendship Rating in adulthood was made by childhood Friendship Rating, but this was only 4%. Performance IQ at Time 1 contributed 3% and the PPVT Time 1 score less than 1%. Friendship Rating at Time 1 contributed 6.4%

of the variability to Language Composite Score in adulthood, the PPVT at Time 1 6.1% and Performance IQ at Time 1 2%. Since none of the predictor variables appeared to contribute significantly to the outcome measures a more detailed analysis was carried out to investigate whether heterogeneity within the group might be masking relationships. The DLD group were divided into two sub-groups, those who had a 'good outcome' (scores of 1-3 on the Outcome Composite Score) and those whose outcome was poorer (scores of 4 and above). A series of correlations were then carried out using the three predictor variables and the two separate outcome groups. Once again no significant correlations were found between any of the predictor variables and the outcome measure.

TABLE 16.14

REGRESSION ANALYSIS RESULTS FOR OUTCOME PREDICTORS IN DEVELOPMENTAL LANGUAGE DISORDER

	Beta	t	p
Overall Composite Score			
PPVT at Time 1	.13	.563	.58
F= .32 d.f. = 1,18 p = 0.58 R^2 = .02			
Friendship Rating			
Friendship Rating Time 1	.20	.878	.39
F=.77 d.f. = 1,18 p = .39 R^2 = .04			
Language Composite Score			
Friendship Rating Time 1	.25	1.11	.28
F=1.24 d.f. = 1,18 p = .254 R^2 = .06			

It has already been seen that 13 (65%) of the group had experienced substantial periods of unemployment or in a series of temporary jobs. These data were used to provide another measure of behavioural outcome and a series of analyses were carried out to see whether

the individuals with stable work records differed from those with more inconsistent employment histories. Childhood measures of language and cognitive functioning were used to investigate their predictive value for later employment history, and are summarized in Table 16.15

TABLE 16.15

THE PREDICTIVE VALUE OF COGNITIVE AND LANGUAGE VARIABLES FOR STABILITY OF WORK RECORD IN THE DLD GROUP

	STABLE			NO STABLE WORK					
	n	Mean	*S.D.*	n	Mean	*S.D.*	t	d.f.	p
Verbal IQ Time 1	*7*	84.4	*4.1*	*10*	71.0	*8.6*	3.84	15	<0.005
Performance IQ Time 1	*7*	94.9	*6.7*	*13*	86.9	*9.8*	1.93	18	n.s.
PPVT Standard Score Time 1	*7*	80.4	*6.1*	*13*	72.8	*11.6*	1.59	18	n.s.
Raven's IQ Time 1	*7*	95.6	*15.9*	*12*	102.4	*21.6*	0.73	17	n.s.

WISC Verbal IQ at Time 1 was shown to have significant predictive power so that those with stable work records had significantly higher verbal IQ's than those who had experienced long periods of unemployment or a series of temporary jobs. The other variables that were investigated but found to lack predictive power were WISC performance IQ at Time 1, PPVT standard score at Time 1 and Raven's IQ at Time 1.

Another measure of employment-related difficulty was whether individuals had experienced substantial problems at work or in their day placements. The same series of tests was carried out but this time on the group of 13 subjects who had experienced no such problems and the

group of 7 who had. The findings here were that none of the childhood variables studied had any predictive value for later difficulties in the workplace.

CONCLUSIONS

There was much evidence in this adult group of problems in the social, behavioural and educational domains. Some subjects had done well, were in work and had experienced stable relationships, although none had apparently 'caught up' in terms of educational attainments. Others had done fairly well in terms of outcome but lacked close relationships, whilst yet others lacked both friends *and* any stable employment record. There was little evidence to support a hypothesis proposing that the social difficulties resulted from social rejection or arose as a direct consequence of language deficits. On the other hand, there were suggestions that the social difficulties may constitute a basic deficit within the disorder, so that for example there was evidence, even amongst those with better outcomes, of subtle deficits in social understanding. The apparent lack of desire for social contact in many of the group also suggested fundamental origins. The evidence on whether there was a real decrease in performance IQ between childhood and adulthood was inconclusive, but if this was shown to be a true decline it would be a further indication that so-called "language disorders" may be broader than language alone.

Little appeared to predict general outcome but it seemed that those with poorer verbal functioning in childhood found it harder to obtain and hold down a permanent job for any length of time.

CHAPTER SEVENTEEN: WHAT IS THE RELATIONSHIP BETWEEN AUTISM AND DEVELOPMENTAL LANGUAGE DISORDERS?

The previous two chapters have been devoted to the separate analysis of autism and developmental language disorders. In this chapter the findings from both diagnostic groups are brought together, and the question of whether there is any evidence of an association between them is given consideration.

BRINGING THE FINDINGS TOGETHER

GENERAL DIFFERENCES BETWEEN THE GROUPS

The findings presented in Section B revealed that there were a number of marked differences between the groups, and on nearly all variables it was the DLD group who were doing better overall. Thus they were, for example, all talking in sentences, whereas 21% of the autism group lacked phrase speech. The autism group also used shorter utterances; showed more difficulty in understanding instructions and plots, and had poorer reporting and conversational skills. Apart from 1 subject who had odd prosody, the DLD group did not show any clearcut evidence of deviant speech, although some did have 'marginal' ratings for prosody and vocal expressiveness. On the other hand, there was a definite minority amongst the autism group who were showing characteristics such as echolalia; stereotyped speech; metaphorical language; pronoun reversal; prosodic oddities, and reduced vocal expressiveness.

With regard to social functioning the autism group were more abnormal in almost every aspect that was examined. There were also clear differences between the groups in terms of the levels of independence they had achieved. Firstly, over half the autism group were living in residential situations, whilst this was true for only 1 DLD subject. The autism group were

also considerably less independent in areas such as self-care, use of the telephone, driving, managing finances, travel and purchasing major items. Over half the DLD group were working independently, but this only applied to 1 member of the autism group, and the majority of subjects in this group were attending day centres or were in residential placements.

Nevertheless, although the DLD group appeared more normal in many respects, it has been clearly demonstrated that many of them were still experiencing difficulties in certain areas. Half the group, for example, had limited conversation, and 35% had difficulty in understanding plots. The Vineland Adaptive Behaviour Scales revealed that the majority of them were functioning at less than 'adequate' levels for their age, in the expressive and written modes, and even though formal assessment measures suggested that the DLD subjects were significantly better on receptive vocabulary and oral comprehension than were the autism subjects, their performances were still in general, found to be considerably impaired. Apart from these language measures it was seen in Chapter 16 that there was much evidence amongst them of continuing difficulties in the social arena and in other areas such as socio-emotional functioning and work-related issues.

OVERALL COMPOSITE SCORE

In Section C the Overall Composite Score was introduced as a measure of overall functioning combining scores on functional language use, independence, friendships and quasi-obsessive and stereotyped behaviours. The results for the individual groups have already been presented in the previous two chapters and a comparison of the findings is given in Table 17.1.

TABLE 17.1

OVERALL COMPOSITE SCORES

Level of functioning on 'Overall Composite Score'	AUTISM	DLD
Near normal	3 *(15.8%)*	5 *(25%)*
Moderate	2 *(10.5%)*	13 *(65%)*
Considerable difficulties	14 *(73.7%)*	2 *(10%)*
TOTAL SUBJECTS	19	20

The range of scores on this composite measure was from '0' to '8'. Subjects scoring '0' or '1' were classified as having 'near normal' functioning; those with scores of '2' to '4' as having 'moderate' problems, and any who had scores of '5' or greater as having 'considerable difficulties'. The mean Overall Composite Score in the autism group was 5.6 (i.e. in the 'considerable difficulties' range), whereas in the DLD group it was in the 'moderate functioning' range (2.7). A t-test analysis of the scores showed that the DLD group were functioning at significantly higher levels ($t = 4.31$; $d.f. = 37$, $p < 0.005$). Whereas in the autism group nearly three-quarters were in the 'considerable difficulties' group, only 10% of the DLD group were. This is further evidence that the autism group had greater levels of impairment overall, but also given that only a quarter of the DLD group were classified as 'near normal', counts as evidence of their lesser, but nonetheless substantial impairments in adulthood.

ADOS ALGORITHM

Another comprehensive measure on which the groups could be compared was the ADOS algorithm, already introduced in Chapter 15. There it was seen that 5 of the 18 autistic subjects for whom data were available (27.7%), met the full criteria for abnormality, with a further 9 (50%) meeting the social and communicative criteria, but not those for restricted,

repetitive and stereotyped behaviours. The profile in the DLD group was very different - none of the subjects met the full criteria for abnormality, but the subject with the lowest verbal IQ did meet the social and communicative criteria. The two groups had been diagnostically distinct in childhood, and so it is no surprise to find that the majority of the autism group, and all but one of the DLD group, could be clearly distinguished by the social and communicative criteria of the ADOS. What is perhaps more interesting is to look more closely at possible similarities between those members of the autism group who did not fulfil the social and communicative criteria for abnormality on the ADOS algorithm, and the DLD group. A thorough analysis of the functioning of the former group has already been given in Chapter 15 where it was seen that their general level of functioning was high, but that there was still evidence of odd or impaired functioning in at least some areas, such as having a literal sense of humour, or slight social disinhibition, as well as the important finding that they lacked sexual relationships. The descriptions of the DLD subjects given in Chapter 16, and Section B, revealed that many of them were experiencing similar types of impairments, and it could be postulated that the most high-functioning members of the autism group appeared closer in many ways to the DLD group, than to the poorer functioning members of their own diagnostic group.

COGNITIVE FUNCTIONING

Both groups appeared to show a similar mean "drop" in Wechsler performance IQ but their cognitive pattern at follow-up was not the same. In the DLD group the means for all Wechsler sub-tests were at much the same level whereas the autism group showed greater scatter. As found in previous studies their scores were highest on block design and object assembly and lowest on picture arrangement and picture completion. There was also evidence that about a quarter of the autism group had special skills that were confirmed using psychometric data. In contrast none of the DLD group showed any of these special talents.

DISCRIMINANT FUNCTION ANALYSIS

Both the univariate analyses and the multivariate analyses based on composite scores provided useful data in determining some of the important differences and similarities between the groups. In addition to these it was decided to make use of another form of multivariate analysis - discriminant function analysis. This was used in the initial study (Bartak et al. , 1977) and it was decided to follow a similar procedure here in order to see how far the groups were discriminable and how much overlap there was between them. The findings from Time 1 are summarised in Chapter 5 (see p. 128).

For the analysis at Time 3, major variables where there were substantial differences between the two groups (defined in terms of those in which $p<0.05$) were identified and divided into 5 groups. These consisted of:- (1) Levels of language use; (ii) Language deviance; (iii) Social functioning; (iv) Independence, and (v) Restricted, repetitive and stereotyped patterns of behaviours, interests and activities. All of this information was informant-based.

A separate discriminant function analysis was carried out for each set of variables with the two diagnostic groups. The variables included in each analysis are listed below in Table 17.2. For each variable a discriminant function coefficient was computed and these are also presented in Table 17.2. The score on each variable was then multiplied by its discriminant function coefficient and these were added together to give a discriminant score for each individual. One subject (A6) had to be excluded from the analyses as some information was incomplete and this multivariate analysis demands complete data. Consequently there were 18 of the autism group and 20 DLD individuals in the discriminant function analysis.

TABLE 17.2

ITEMS USED IN DISCRIMINANT FUNCTION ANALYSIS WITH THEIR DISCRIMINANT FUNCTION COEFFICIENTS

(i) Level of language use

1. Overall level of language	-0.41
2. Utterance length	0.30
3. Understanding instructions	-0.14
4. Understanding plots	0.87
5. Reporting	0.14
6. Conversational abilities	0.20

(ii) Language deviance

1. Echolalia	-0.40
2. Stereotyped phrases	1.24
3. Pronoun reversal	-0.08
4. Prosodic oddities	-0.17
5. Reduced vocal expressiveness	0.44

(ii) Social functioning

1. Sense of humour	0.50
2. Turn-taking	0.04
3. Understanding rules	-0.16
4. Greeting behaviour	0.13
5. Quality of social response	0.14
6. Shared enjoyment in interaction	0.95
7. Acquaintances	-0.11
8. Leisure activities outside the home	0.61

(iv) Independence

1. Self-care	-0.04
2. Use of the telephone	0.23
3. Driving	-0.11
4. Managing finances	0.17
5. Purchasing major items	0.80
6. Travel	-0.06

(v) Restricted, repetitive and stereotyped patterns of behaviours, interests and activities

1. Unusual preoccupations	0.12
2. Resistance to change	-0.23
3. Unusual sensory interest	0.55
4 Verbal rituals	0.45
5. Compulsions/rituals	0.12
6. Oddity of gait	0.73
7. Hand and finger mannerisms	0.03
8. Other mannerisms and stereotyped movements	-0.28

A glossary of terms used in the following section is given in Appendix XXI. Figures 17.1 - 17.5 show diagrammatically where the discriminant scores of each individual fell on the different analyses. The group centroids are also displayed. Individuals were classified as belonging to the group which had the group centroid closest to their own discriminant score.

The results for each analysis were as follows:

(i) Level of language use

The 6 variables used in this analysis are listed in Table 17.2 above and covered grammatical complexity, ability to understand instructions and plots, conversational skills and reporting events. The groups were found to be significantly discriminated ($x^2 = 15.2$, *d.f.* = 6, $p = 0.02$, *eigenvalue* = 0.59, *Wilk's lambda* = 0.63, see Appendix XXI for glossary).

Figure 17.1 shows diagrammatically where the discriminant scores of each individual fell, and Table 17.3 presents the information relating to predicted group membership.

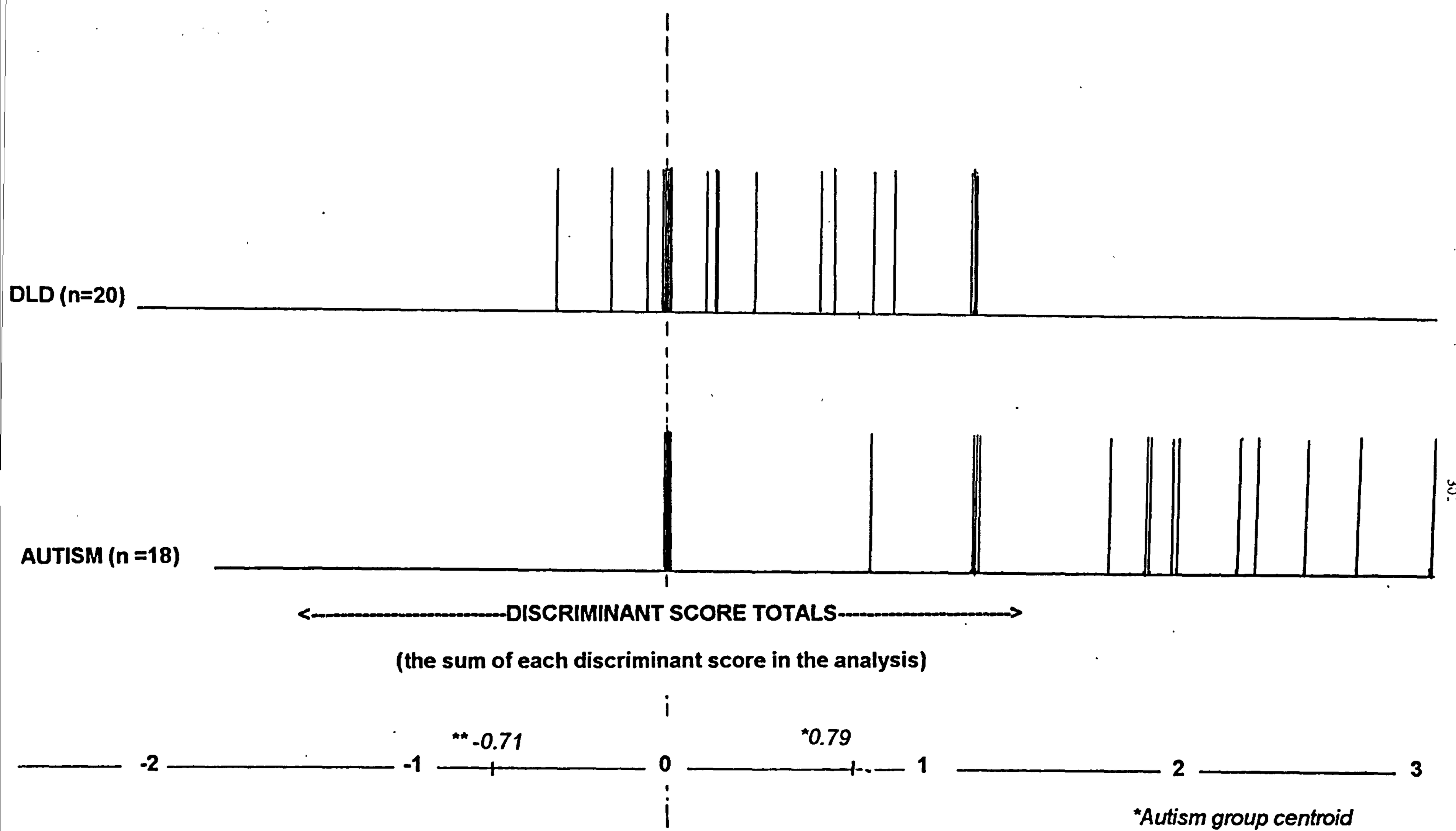


FIGURE 17.1 Discriminant Function Analysis

Levels of language use

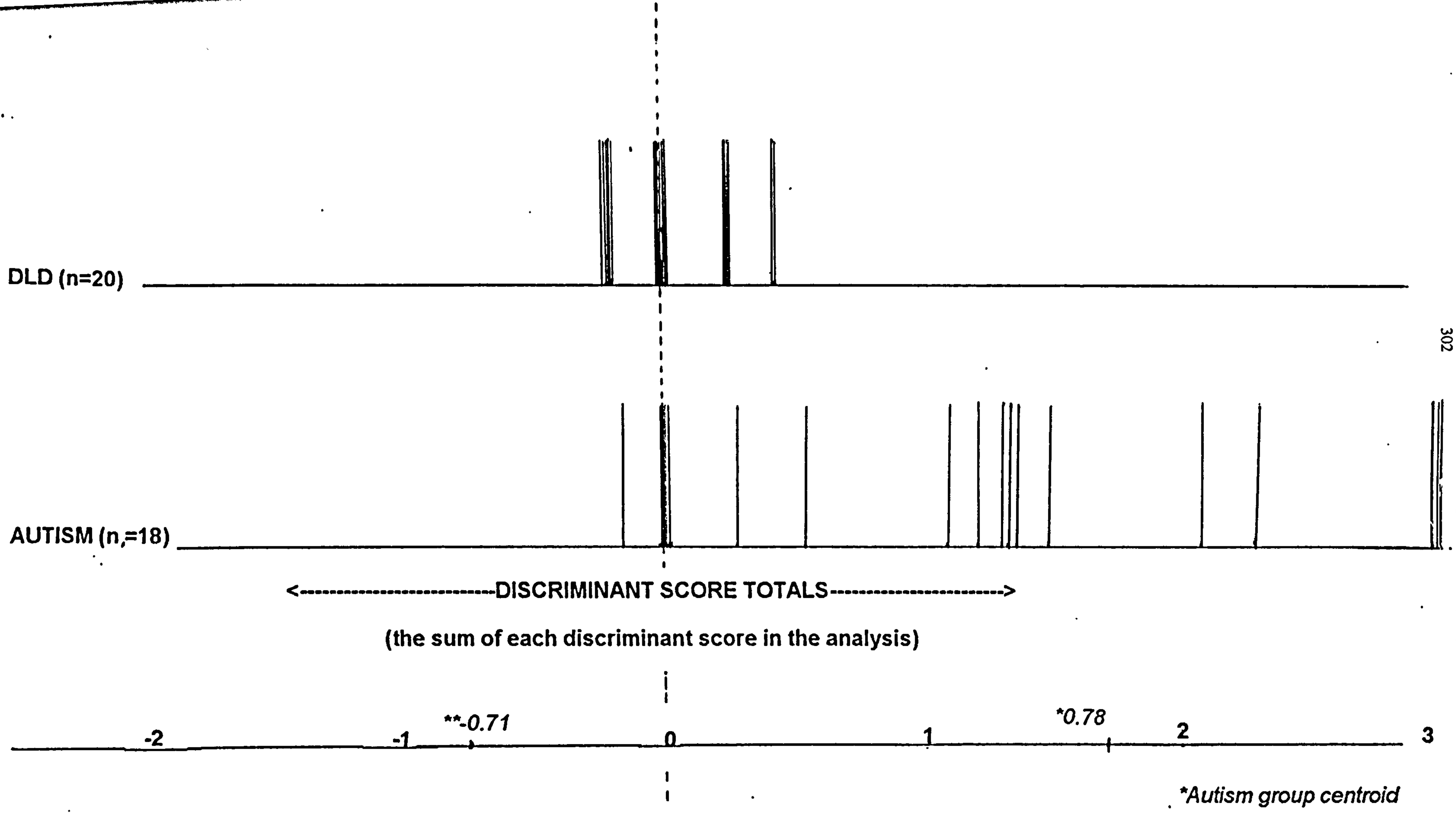


FIGURE 17.2 Discriminant Function Analysis

Language deviance

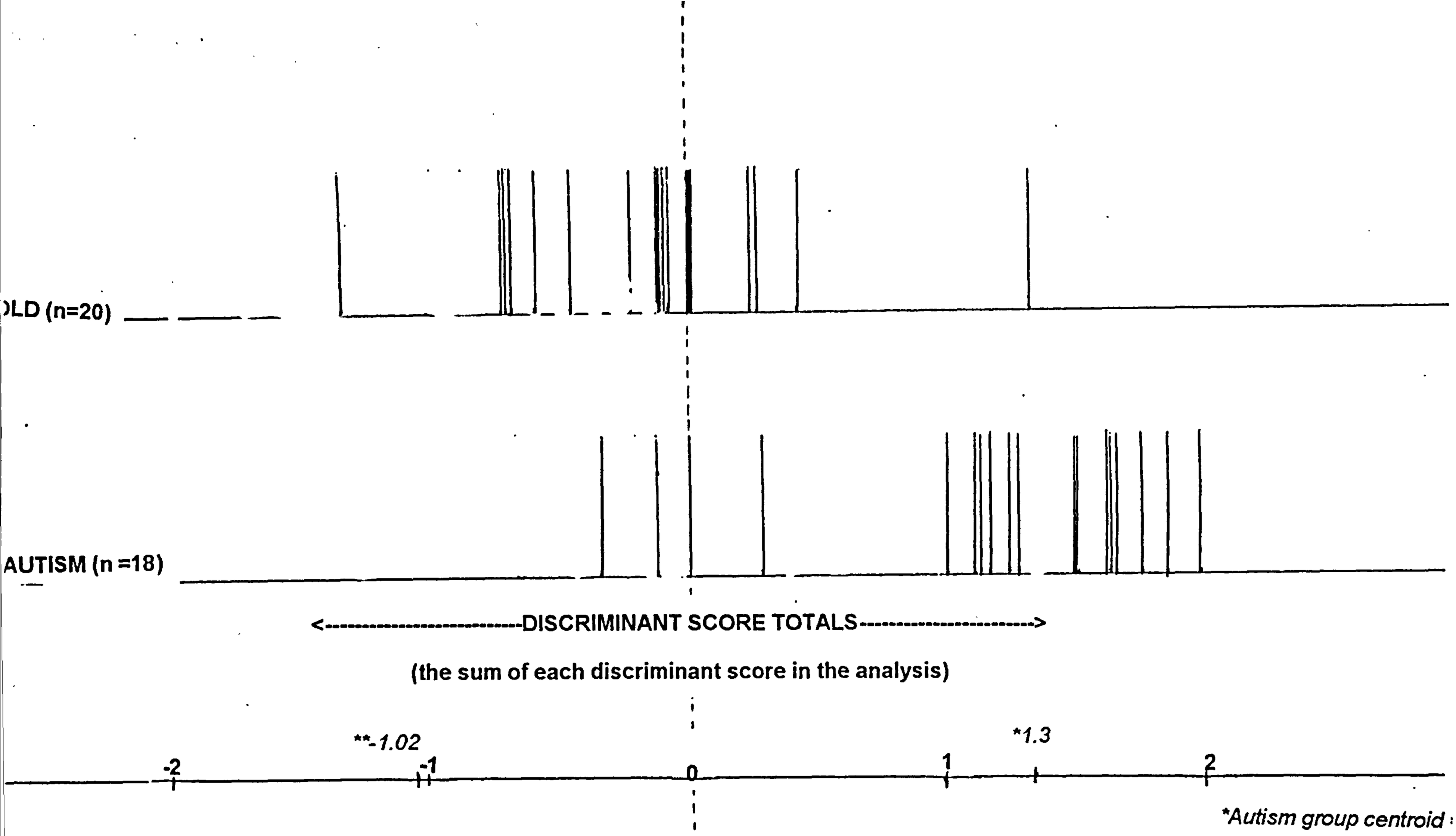
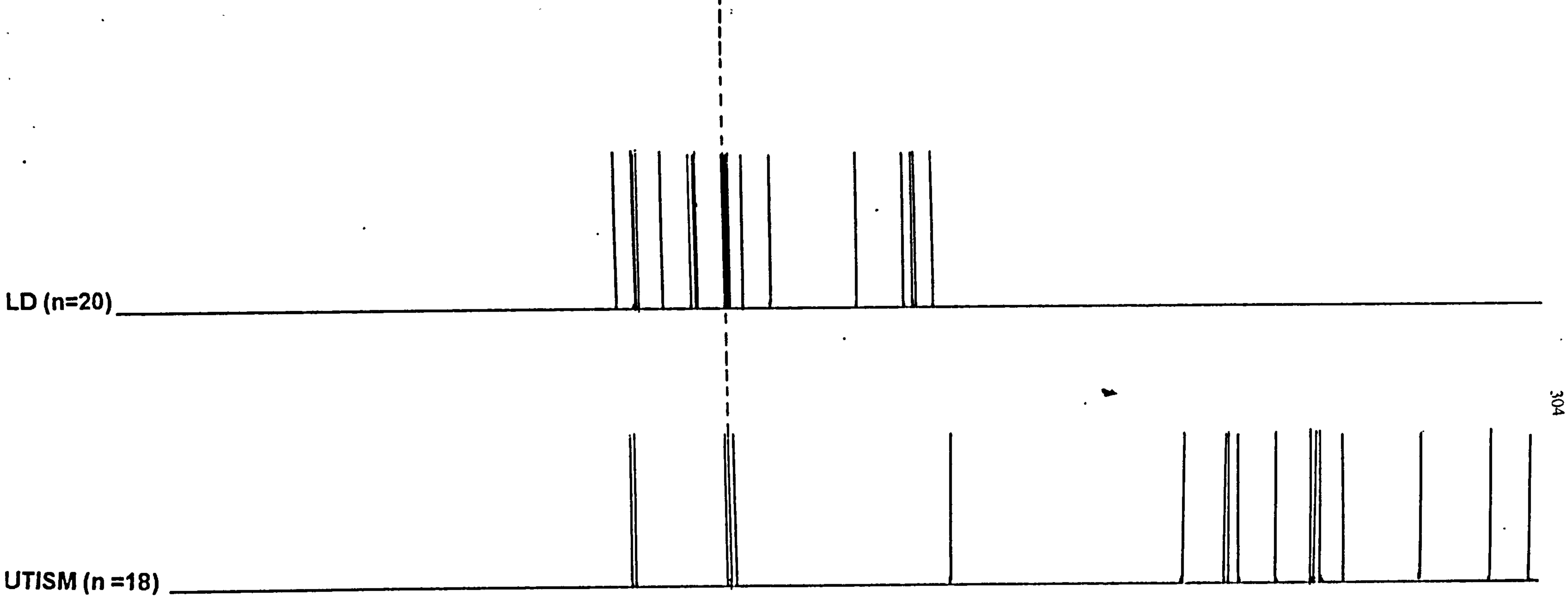


FIGURE 17.3 Discriminant Function Analysis

Social functioning



<----------DISCRIMINANT SCORE TOTALS---------->

(the sum of each discriminant score in the analysis)

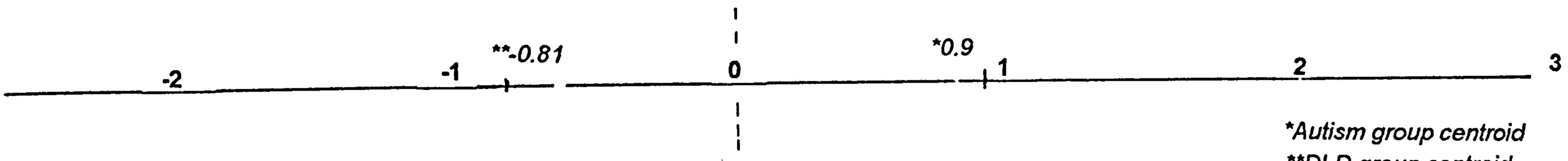
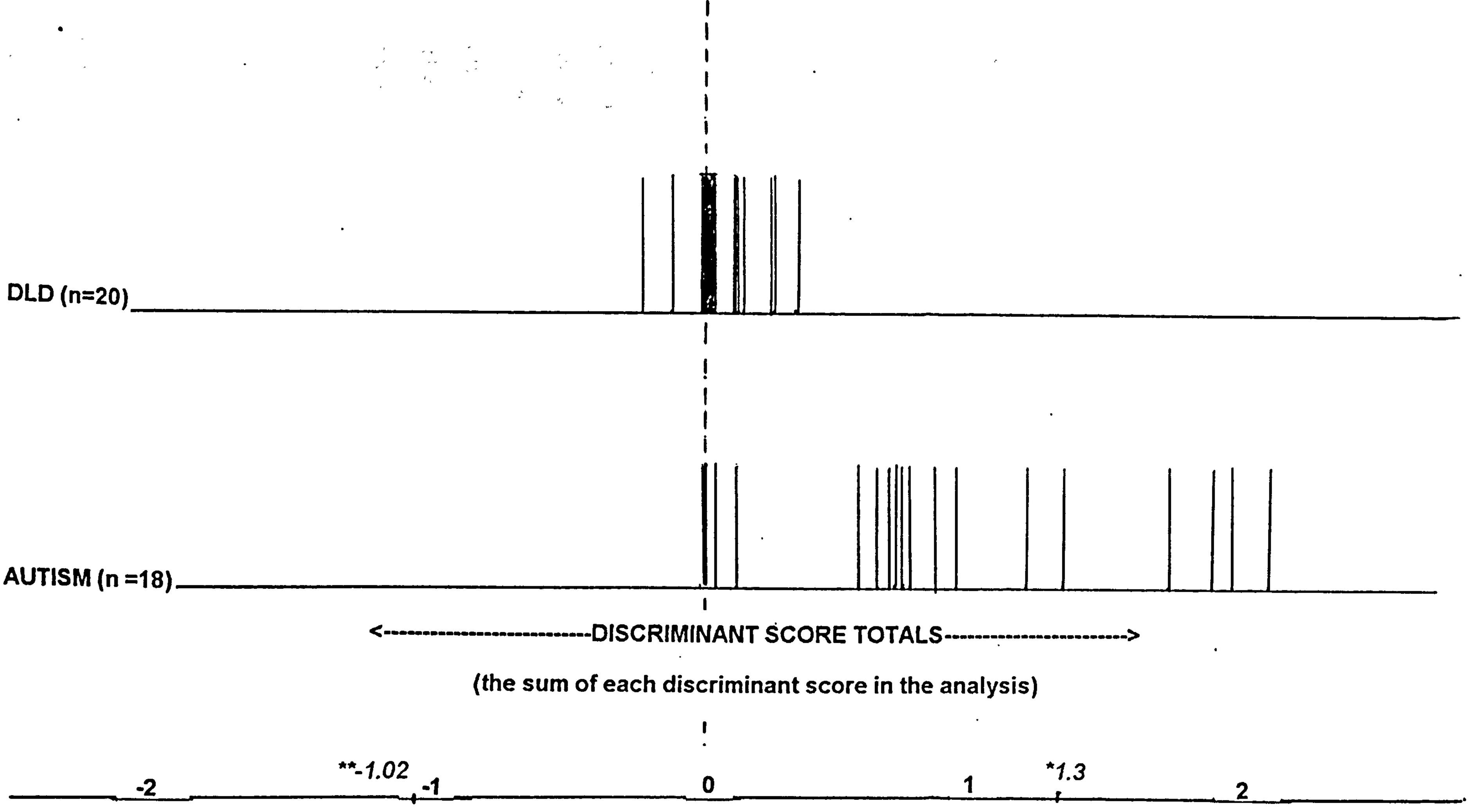


FIGURE 17.4 Discriminant Function Analysis

Independence



*Autism group centroid

** DLD group centroid

FIGURE 17.5 Discriminant Function Analysis

Restricted, repetitive and stereotyped patterns of behaviours, interests and activities

TABLE 17.3

GROUP MEMBERSHIP PREDICTIONS FOR 'LEVEL OF LANGUAGE USE'

DISCRIMINANT FUNCTION ANALYSIS

	Predicted as belonging to:	
	*AUTISM**	*DLD***
Actual group membership		
Autism (n = 18)	14	4
DLD (n = 20)	11	9

** Group centroid = 0.79; ** group centroid = -0.71*

It can be seen from Table 17.3 that 4 of the autism group were "misclassified" into the DLD group on this function. On closer examination these were found to be the 4 individuals who were rated as having 'good' functional language on the Language Composite Score in Chapter 15. A less expected finding was that over half the DLD group were "misclassified" into the autism group. The main factors contributing to the "misclassification" were difficulties in understanding plots, and reduced conversational and reporting skills. More consideration is given to individual misclassifications later in this chapter.

(ii) Language deviance

Five variables were used in computing this function. They covered some of the deviant language behaviours that are typically associated with autism (echolalia, stereotyped phrases, pronoun reversal, prosodic oddities and reduced vocal expressiveness) and so it was to be expected that the groups would be significantly discriminated and they were (x^2 = *15.5, d.f. = 5, p = 0.008, eigenvalue = 0.59, Wilk's lambda = 0.63*). Nonetheless there was some overlap as Table 17.4 and Figure 17.2 show.

TABLE 17.4

GROUP MEMBERSHIP PREDICTIONS FOR 'LANGUAGE DEVIANCE'

DISCRIMINANT FUNCTION ANALYSIS

	Predicted as belonging to:	
	*AUTISM**	*DLD***
Actual group membership		
Autism (n = 18)	13	5
DLD (n = 20)	6	14

** Group centroid = 0.78; ** group centroid = -0.71*

Table 17.4 shows that there were 6 members of the DLD group who were "misclassified" as autistic . Closer examination of their scores revealed that this was mainly due to instances of

reduced vocal expressiveness and prosodic oddities. Conversely 5 members of the autism group were closer in score to the DLD group.

(iii) Social functioning

This function was comprised of 8 variables, all of which have implications for social functioning, ranging from ability to make acquaintances and quality of social response to turn-taking, understanding rules and involvement in leisure activities outside the home. A complete list is given in Table 17.2. Once again the groups were significantly discriminated (x^2 *= 25.6, d.f. = 8, p = 0.002, eigenvalue = 1.25, Wilk's lambda = 044)*, but also as before there were a number of "misclassifications". Table 17.5 and Figure 17.3 present these findings.

TABLE 17.5

GROUP MEMBERSHIP PREDICTIONS FOR 'SOCIAL FUNCTIONING'

DISCRIMINANT FUNCTION ANALYSIS

	Predicted as belonging to:	
	*AUTISM**	*DLD***
Actual group membership		
Autism (n = 18)	15	3
DLD (n = 20)	4	16

** Group centroid = 1.3; ** group centroid = -1.02*

Three members of the autism group were "misclassified", as were 4 of the DLD group.

(iv) Independence

This function was comprised of 6 variables covering independent functioning in self-care, use of the telephone, driving, managing finances, making purchases and travel. The groups were significantly discriminated (x^2 = *18.8, d.f. = 6, p = 0.005, eigenvalue = 0.77, Wilk's lambda = 0.57*). However, once again there was a considerable degree of overlap and Table 17.6 and Figure 17.4 show this.

TABLE 17.6

GROUP MEMBERSHIP PREDICTIONS FOR 'INDEPENDENCE'

DISCRIMINANT FUNCTION ANALYSIS

	Predicted as belonging to:	
	*AUTISM**	*DLD***
Actual group membership		
Autism (n = 18)	13	5
DLD (n = 20)	7	13

** Group centroid = 0.9; ** group centroid = -0.81*

Five of the autism group and 7 of the DLD group were "misclassified".

(v) Restricted, repetitive and stereotyped patterns of behaviours, interests and activities

Since this function was made up of 8 variables all of which are frequently found in autism it was again to be expected that the group would be significantly differentiated and this was confirmed by analysis ($x^2 = 20.1$, *d.f.* = 8, $p = 0.009$, *eigenvalue* = .87, *Wilk's lambda* = 0.53). Nonetheless, there was still overlap as shown in Table 17.7 and Figure 17.5.

TABLE 17.7

GROUP MEMBERSHIP PREDICTIONS FOR 'RESTRICTED, REPETITIVE AND STEREOTYPED PATTERNS OF BEHAVIOURS, INTERESTS AND ACTIVITIES ' DISCRIMINANT FUNCTION ANALYSIS

	Predicted as belonging to:	
	*AUTISM**	*DLD***
Actual group membership		
Autism (n = 18)	15	3
DLD (n = 20)	7	13

** Group centroid = 1.3; ** group centroid = -1.02*

Three of the autism group were closer to the DLD group centroid because they showed a distinct lack of these behaviours, but perhaps more surprisingly 7 of the DLD group were "misclassified". Closer examination of the individual scores and variables revealed that the main variables contributing to the "misclassification" of the DLD subjects were 'preoccupations' and 'rituals/compulsions'.

Comparison between analyses

Whereas the discriminant function analyses carried out at Time 1 showed a very clear separation of the two groups, with very little overlap on any of the functions, this was not the

case in adulthood. An examination was carried out of the cases who were "misclassified" in each of the analyses and is given in Tables 17.8 and 17.9. The labels used to identify the subjects are the same as those in Appendix VII where individual vignettes are presented.

Table 17.8, overleaf, summarises the findings for the autism group. Occurrences of 'yes' in the table denote a "misclassification" whilst '-' is used to refer to a correct classification.

It can be seen from Table 17.8 that 11 cases (61.1%) were correctly classified as belonging to the autism group in all five analyses. Of the remainder, 1 case (A18) was incorrectly classified in all five analyses, 2 cases (A3 and A7) in four; A19 in three; A15 in two and A13 and A17 in one analysis. It is relevant to note that the cases described in Chapter 15 as having 'good' functional language were A3., A7, A18, and A19,. Subject A15 was classified as having 'fair' language functioning. It is also of interest that in general the patterns of cognitive functioning were reported to differ between the two diagnostic groups with the autism group having higher performance than verbal IQ's. Subjects A3, A18 and A19 showed the reverse pattern.

TABLE 17.8

MISCLASSIFICATIONS OF INDIVIDUAL AUTISTIC SUBJECTS IN THE FIVE DISCRIMINANT FUNCTION ANALYSES

AUTISM	*Lang use*	*Lang deviance*	*Social*	*Independence*	*Restricted and Behavs.*
A1	-		-	-	-
A2	-	-	-	-	-
A3	YES	YES	-	YES	YES
A4	-	-	-	-	-
A5	-	-	-	-	-
A7	YES	YES	YES	-	YES
A8	-	-	-	-	-
A9	-	-	-	-	-
A10	-	-	-	-	-
A11	-	-	-	-	-
A12	-	-	-	-	-
A13	-	-	-	YES	-
A14	-	-	-	-	-
A15	-	YES	-	YES	-
A16	-	-	-	-	-
A17	-	YES	-	-	-
A18	YES	YES	YES	YES	YES
A19	YES	-	YES	YES	-

Table 17.9 overleaf presents a summary of the information relating to the DLD group in an identical way to that in Table 17.8.

TABLE 17.9

"MISCLASSIFICATIONS" OF INDIVIDUAL DLD SUBJECTS IN THE FIVE DISCRIMINANT FUNCTION ANALYSES

DLD	Lang use	Lang deviance	Social	Independence	Restricted and Repetitive Behavs.
DLD1	YES	-	-		YES
DLD2	-	-	-	-	YES
DLD4	-	-	-	-	-
DLD6	YES	-	-	-	YES
DLD7	YES	YES	YES	-	-
DLD8	YES	-	YES	YES	YES
DLD9	YES	YES	-	-	YES
DLD10	YES	-	YES	YES	YES
DLD11	-	YES	YES	-	-
DLD12	-	YES	-	-	-
DLD13	YES	-	-	-	-
DLD14	YES	YES	-	YES	YES
DLD16	YES	-	-	YES	-
DLD17	-	-	-	-	-
DLD18	-	YES	-	-	-
DLD19	YES	-	-	YES	-
DLD20	-	-	-	-	-
DLD21	YES	-	-	YES	-
DLD22	-	-	-	-	-
DLD23	-	-	-	-	-

Table 17.9 reveals that amongst the DLD subjects there was much more variation with only 5 cases (25%) being correctly classified in all five analyses. Closer examination showed that all of these were in employment, and all but one had experienced close heterosexual relationships. At the other extreme 2 subjects (DLD 48 and DLD 54) were "misclassified" in 4 areas and whilst the first impression on meeting these individuals had been that they were functioning reasonably well, it had transpired that they had both been unemployed for a long period, had interests that preoccupied them, and that their plans for the future were unrealistic.

The ability of discriminant function analysis to detect qualitative differences between groups depends on which variables are measured. A different combination of variables may have resulted in different findings, but it is clear that the subjects from the autism group who were 'misclassified' were those who were the most able. The reverse was true of the DLD group. This suggests that the discriminant functions used did produce a meaningful discrimination.

SUMMARY

Making use of all the available information here it has been demonstrated that there is still a group of individuals who are clearly classified as autistic on a range of measures. A further group did not appear in the autism range on some of the measures, but only 1 individual did not appear autistic on *any* of the measures in this chapter. Amongst the DLD individuals a minority appeared to be clearly discriminated from the main body of the autism group, but the majority appeared to overlap on one or more of the measures. These findings indicated that whereas in early childhood there was found to be little overlap between the groups, in adulthood there appeared to be similarities between certain sub-groups. In other ways, (e.g.

with

in "pattern of cognitive functioning"), the groups appeared to be largely different , but again with some areas of overlap. There were, for example, the 3 members of the autism group who had verbal IQ's that were higher than their performance IQ's, and these were also amongst the group with the best outcome.

CHAPTER EIGHTEEN: CONCLUSIONS

INTRODUCTION

This concluding chapter summarises the findings and how far the aims of the study have been met. It also includes a discussion of the methodological issues and some suggestions for further research.

This study set out with the aim of addressing five rather different issues:-

(i) Is autism as narrow and specific a deficit as some have claimed?

(ii) What is the association between developmental language disorder and socio-behavioural/educational problems?

(iii) How can outcome be predicted in developmental language disorder?

(iv) What is the relationship between autism and developmental language disorders?

(v) What is the psychiatric risk in developmental language disorder?

The data obtained during the course of this research have proved to be valuable in addressing all of these issues to a greater or lesser degree, as has been seen in the preceding three chapters. This study did not face many of the drawbacks that have often been found in the field of language research (see Rutter and Mawhood, 1991). Thus, it had particular strengths in that the groups seemed to be relatively homogeneous in type and severity; the subjects were outside the learning-disabled range; at least some data were available from 3 or more time-points; the data sets in early childhood and in adulthood were

virtually complete, and there was a detailed initial assessment of speech and language together with data on key predictors such as verbal IQ, performance IQ and friendships in childhood. Also this was a follow-up into adult life, which is quite rare. Almost inevitably, however, despite these strengths it faced certain methodological weaknesses. The most important of these are discussed on the following pages and consideration is given to how they have influenced the types of conclusions that can be drawn from the data.

METHODOLOGICAL ISSUES

(1) DIFFERENT FORMS OF TEST OVER TIME

The constraints imposed by test design meant that it was necessary to use different forms of the Wechsler test initially and in adulthood. This limited to some extent the conclusions that could be drawn about cognitive changes over time. There is no straightforward solution to this problem and it proved impossible to find any studies that reported comparative data relating to the two forms of Wechsler test that were used here. The findings that are available for other comparisons of Wechsler tests are difficult to interpret because of their contradictory findings. Some studies (e.g. Avery et al., 1989; Sattler et al., 1984) have found WAIS-R scores to be higher than WISC-R scores, whilst others report the reverse situation (e.g. Quereshi et al., 1989; Slate et al., 1990). Another problem in interpreting these studies is that many report on full-scale IQ rather than on comparisons of the individual scales (see p. 92 for a fuller discussion of these issues). Nonetheless despite these factors it was possible to extract some valuable findings from the data. Whereas the change in Verbal IQ in the DLD group between Times 1 and 3 was very small, the autism group showed an average increase of 16.5 IQ points (S.D. = 12.8). The finding that the pattern of change in the two groups differed indicated that the change was real rather than being due to standardization errors in the forms of test used.

(2) MISSING DATA

The problem of missing data is a common one encountered in many types of research. Rarely is there a straightforward solution, although various methods have been proposed that deal with different types of missing data, and resolve the problem with varying degrees of success (Little and Rubin, 1987; Rovine and Delaney, 1990).

One very simple, and perhaps the simplest, method is to discard any subjects who have missing data and analyse only those cases who have complete data. This method is easy to implement, but is only satisfactory where there are small amounts of missing data. It leads to increasingly serious biases as the amounts of missing data become larger, and it is also fairly inefficient since the opportunity to make use of existing data is lost. This simple procedure was used in some individual analyses here, either because the amounts of missing data were very small (e.g. 1 DLD subject did not have data from psychometric assessments and so these particular analyses were carried out with 19 instead of 20 subjects), or because it was not felt prudent in certain circumstances to use a method involving score allocation due to the small sample size. Thus, for example, there were quite large amounts of missing data at Time 2 because a proportion of the subjects were not included in this follow-up. It was decided to analyse what data were available and where possible to carry out further analyses that compared the incomplete data set and the complete data set at another time-period in order to search out possible sources of bias (see Table 15. 7 for an example of this). It is important to note that these data appeared to be missing at random. In so far as it was possible to determine some fifteen years on, there did not seem to be any systematic bias[1] in operation.

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[1] E.g. factors such as testability or severity of disorder.

A second category of method for dealing with missing data is imputation. In this type of procedure the missing values are filled in and the resultant complete data set is analysed by standard methods. Various procedures are available for allocating the missing values and one of these is regression imputation. Programs are available (e.g. Module 5 of BMDP PC90, 1985) that will use regression techniques to determine the most likely values for the missing scores. In these particular circumstances, however, the numbers involved were quite small and since regressions on very small numbers are unstable this method was not appropriate for use here. There were 9 members of the autism group who had missing Verbal IQ scores at Time 1 and it was decided to use a simplified version of imputation to allocate them scores. These missing data were not, in contrast with the missing Time 2 data, random omissions, but instead appeared to be in most instances due to a lack of testability either due to disruptive behaviour or because their scores were below the floor of the test. Consequently some measure of clinical judgement, together with examination of the scores on other tests administered at Time 1, was used to make a decision about the likely reason for the omitted score and then scores were allocated randomly within the range judged to be most appropriate. There appeared to be no straightforward solution to the problem of missing data in these circumstances and this was considered to be a reasonable compromise. Many of the analyses would have been impossible or very limited with such large amounts of missing data and although the findings need to be interpreted with some degree of caution, they have nonetheless been valuable in highlighting trends. It is worth noting that the mean increase in scores of those who had Verbal IQ scores assigned to them was similar to those who had real test results.

(3) REDUCED DATA SET AT TIME 2

It has already been noted that the data set at Time 2 was considerably smaller than at either Time 1 or Time 3 where the data were almost complete. This clearly poses problems in

interpreting the findings at Time 3. Because the data appear to be missing at random and therefore probably lack serious biases it is possible to make use of the data in examining general trends, but it would not be wise to place too much reliability on the findings for the groups at Time 2 alone, and consequently these types of analyses have largely been avoided here.

(4) INTERPRETATION OF THE PEABODY PICTURE VOCABULARY TEST RESULTS

Although the British Picture Vocabulary Scales (BPVS) were used to gather the data at Time 3, the data set proved to be unsatisfactory. The main problem was that the calibration and standardisation did not extend far into areas of very low ability, nor did the standardisation data go beyond the age of 18 years. Once it became apparent that there were a number of subjects whose functioning was below the floor of this test the decision was made to use a procedure that converted these scores to their equivalents on the Peabody Picture Vocabulary Test (see p. 95 and Appendix V). The decision to use the BPVS was originally taken to provide compatibility with other research taking place in the Department, but in retrospect it would have been preferable to have used the PPVT throughout. Any process of conversion has some hazards, however minimal, and these should be avoided where possible. Despite the drawbacks these data were valuable, but require a note of caution about their interpretation since they were not obtained through the usual route. Additionally there were some problems in making use of the standard scores on the PPVT as some subjects scored below even the level to which the standard scores had been extrapolated. This problem was addressed in different ways according to the situation, so that in some reporting these subjects were treated as though they had scores at the basal level, but with a word of warning in the text; in other circumstances the raw scores were used for descriptive statistics, and in yet further instances the data were presented in terms of the percentage of subjects scoring above a standard score of 70 in order to circumvent the problems presented by having some imprecise scores in the lower ranges.

(5) INCONSISTENCIES BETWEEN DIFFERENT METHODS OF DATA COLLECTION

Conflicting data may prove to be a hazard when different methods of data collection are used within the same study. Thus Caulfield et al. (1989) noted in their research that some behaviours that were evident from observation were not noted when an informant-based report was the data source. Rumsey et al. (1985) also found differences in the prevalence estimates of certain behaviours such as motor stereotypies. In their case they found that parental reports yielded higher estimates than naturalistic observations. Much of the data used in the current study came from informant reports and although the issue of reliability does need to be considered, it appears that in these circumstances it was a particular strength of the study that a mixture of observational and informant-based methods were used for data collection . Thus the ADOS was used to observe subjects and code certain behaviours in a standardized way and since these results were presented, when appropriate, alongside the informant-based data they served as a useful additional source of information. The findings from the two sources appeared to be broadly similar, indeed it was probably the case here that the observational method resulted in some under-reporting of certain behaviours due to the fact that the ADOS is only 20 minutes in duration and therefore some target behaviours were not displayed within this time-period. Consequently it was valuable to have the benefit of the informant's knowledge of these behaviours in order to pick them up at all. For purely factual information such as where the subject was living or whether he was in employment, the informant was generally considered to be reliable and often in those cases where there was a query (e.g. over numbers of jobs held in the past) it was possible to confirm details with the subject himself.

(6) LACK OF A NORMAL CONTROL GROUP

There were certain analyses where it would have helped to have a normal control group. Thus, for example, whilst it appeared to be exceptional that so many of the DLD group lacked friends in adulthood this could only be given anecdotal importance without normative data with which to compare it. Similarly it would have been helpful to have had normal control data in a number of other domains such as 'problems at work'; 'leisure interests' and 'acquaintances'. It proved possible to obtain some relevant data on the 'age of leaving home' and on 'sexual relationships' in the general population and these were valuable in confirming that both groups were unusual in these respects. Similarly the normative data provided by the Vineland Adaptive Behaviour Scales were useful in providing a general indication of abnormalities in the communicative, social and adaptive domains.

(7) MULTIPLE SIGNIFICANCE TESTING

This issue was first raised in Chapter Six (see p.147). It applies, however, throughout the thesis since so many statistical tests were carried out. It can be argued that with a large number of tests the probability of a significant result arising by chance is increased. It was decided not to use the Bonferroni adjustment here (Altman, 1979)[2], since its value and mode of use are both debatable. One major difficulty is that there is no consensus over how far it should be applied (e.g. to each table; to all the results in a study....). Another difficulty is that since this method works by raising the threshold for inferring statistical significance it assumes that real findings will be more statistically significant and chance ones less so. This is not the case since although it is true that only 1% of findings at the 1% level of significance will be chance, whereas 5% of those at the 5% level of significance will be so, this method still gives no way of determining which particular results are chance and which are not. It may make sense to use this method where there is a very large sample and the

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[2]This requires that each critical p-value is multiplied by the number of tests done.

potential for very large differences but in a relatively small sample, as here, it seems a high price to pay that the 95% of differences at the 5% level that are truly valid should be discarded. Consequently the approach taken here has been to give a general consideration to the consistency of patterning of the findings across different measures, and in the majority of cases the conclusions that have been drawn have been based on a *set of findings*, rather than on *individual* significant results. Thus, for example, it was clear from a variety of different measures that the autism group were less independent and less socially developed than the DLD group, and also that they showed more quasi-obsessive behaviours. The findings for the DLD group also appeared to be consistent in that they had what was in general a lesser but nonetheless noteworthy level of abnormal functioning in a number of areas.

(8) ISSUES THAT RELATE SPECIFICALLY TO FOLLOW-UP RESEARCH

Three design features are highlighted by Labouvier (1986) that have a particular influence on the explanatory power of follow-up research. The first is the choice of time-lag between the studies. This has a strong influence because the longer the time interval between data, the more will have happened to an individual and therefore there are an increased number of competing hypotheses and explanations that need to be taken into account. As Rutter (1988) observes it is often unhelpful to examine causal processes in terms of a correlation between a hypothesised risk factor (e.g. a language deficit) and a pathogenic outcome (e.g. poor social functioning). Instead a multiplicity of intervening events could affect long-term outcome in the form of chains and linked sequences of events. If the interval between studies is too large then the opportunity to study these influences is lost .. In this study the interval between middle childhood and early adulthood was a period in which the subjects experienced many important events. Leaving school, for example, brings changes in social structure and often the loss of a support network. Other individuals experienced major life events such as a parent dying. A large volume of other data was being collected here and

so these particular sorts of data were not collected in any consistent way. A shorter interval between follow-up studies would have made this more practical, however.

A second important factor is whether the focus of measurement lies with 'differences' or 'change'. In this study analysis has taken place at both the inter-individual and intra-individual levels. The former approach has proved to be important in facilitating a comparison of the groups and assessing, where normative data were available, ways in which they might be abnormal. The latter approach has allowed patterns of change *within* individuals to be investigated. These findings have been introduced where relevant as they have helped to clarify what really happened in terms of change. It is possible for simple group comparisons to mask the patterns, as the overall change within the group may be variable and individual effects get diluted.

The third issue is the degree of specificity with which the predictors and outcomes are measured. This can be referred to as the problem of 'functional equivalence'.
It was apparent in this study, for example, with the analyses that looked at changes in social functioning over time that the definition of 'friendship' was much more specific in adulthood than it had been in early childhood. Whilst the coding at Time 1 had been a simple 'has friends/dubious/does not have friends' classification, this would not have been adequate to address the more sophisticated requirements of adult friendships. Consequently, in order to have a normal score in adulthood the relationship had to be with someone of a similar age; there had to be shared interests outside a formal group setting, and there also needed to be definite reciprocity and mutual responsiveness in the relationship. The variables being measured in childhood and adulthood were therefore different and it is important to recognise in interpreting change in social functioning over time that it cannot be a very precise measure because of this. Both the childhood and adult codings that were used here, however,

approximate to 'normal', 'slightly limited' and 'very limited' in friendship and the consistency in this essential meaning could be argued to provide some continuity to the measure.

In terms of analysis, longitudinal research has come a long way and there are now many complex and sophisticated methods available for the analysis of developmental data. These have different mathematical and statistical emphases and they differ in the way in which they organise the data. What they all have in common is a focus on understanding the *patterns of change* in data (von Eye, 1990 gives a useful description of the different methods available). The needs of this study were somewhat different, however, and it was felt that the risk of heterogeneity and the small sample size made it unfruitful to conduct elaborate statistical analyses. For the most part, therefore, relatively simple analytic methods were used here.

WHAT DO THE FINDINGS MEAN?

Despite the limitations that are frequently encountered in follow-up research this study has managed to make useful contributions to the knowledge about these two diagnostic groups. The findings in relation to each specific aim are summarised and developed below.

IS AUTISM AS NARROW AND SPECIFIC A DEFICIT AS SOME HAVE CLAIMED?

The data relating to this issue were given detailed consideration in Chapter 15 and it was shown that even in adulthood, autism encompasses deficits in functions as wide-ranging as

language, communication, social relationships, scholastic achievement, daily living skills, employability and socio-emotional expressiveness.

Some theories claim that a narrow and specific deficit underlies autism (e.g. Baron-Cohen, 1990; Hobson, 1989) but here the essential question must be whether a 'narrow' theory has *enough explanatory power* to account for these diverse findings. In an excellent review Bailey et al. (in press) assess the competing theories and how well they account for the deficits observed in autism. The theory of mind approach, for example, accounts well for the social and pragmatic deficits. It is less able, however, to explain the *centrality* of the language impairment in autism. That language impairment should be so central in the disorder is a very striking finding. Thus this study found that a very straightforward language test predicted outcome some 16 years later. Evidence from genetics research also suggests that language has a central role in the disorder. Bolton et al. (1994) found that verbal intelligence is related to genetic liability so that the familial loading was associated with a symptom score in verbal subjects, but not in those without speech.

Whilst it seems likely that the 'narrow' deficits are found in at least a large proportion of people with autism (e.g. even some individuals with autism and a high verbal IQ do not pass theory of mind tests[3], and the current study found that emotional expressiveness in the autism group was given a higher oddity rating than in the DLD group[4]), it does not necessarily follow that the narrow deficit is therefore the underlying cause of the disorder. Any successful theory needs to be able to account for the finding that there was a close correlation in this research between language and social functioning in adulthood. Quite why this relationship was not demonstrable at the earlier two time-points is not clear, although it may reflect the less sophisticated nature of the social definitions that were in use then. Both

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[3] Frith, Morton and Leslie, 1991.
[4] See Chapter 14.

the affective and theory of mind approaches would explain this correlation as a consequence of the underlying deficit, but another indication of interconnections between the domains is less easy to explain in these terms. Bolton and his colleagues (1994) found that many of the behavioural features of autism, including poor social functioning and language deficits tend to cluster together in the relatives of individuals with autism. It is not easy to see how the narrow theories can explain this finding.

There are, however, a number of possible mechanisms that allow both the narrow and broad approaches to be represented within the same theoretical framework. One causal mechanism could be that the narrow deficit underlies the disorder and leads to the broad dysfunction. This seems somewhat implausible, however, and there is little evidence to support such a viewpoint. There is a stronger argument for the converse situation, however, and Bailey et al. (in press) give the example of theory of mind deficit arising from an executive dysfunction. Several mechanisms are proposed but the strongest in theoretical terms seems to be that within the range of executive dysfunctions is difficulty in cognitive set-shifting. This, it has been argued, might account for joint attention deficits, which as was seen in Chapter One, many consider to have a precursor relationship to theory of mind (Baron-Cohen, 1989). A third possible mechanism is that the two types of deficit could co-exist independently. Such a proposal has been made by Frith and Happe (1994) with a deficit in theory of mind and weak central coherence existing independently. They propose that the different deficits have effects on different aspects of functioning; theory of mind deficits accounting for the dysfunctions in the more socially biased areas such as social functioning and pragmatics, and weak central coherence accounting for the non-social deficits.

Taken together the findings from this study and from other research in autism do not support the view that a narrow theory alone can adequately account for the wide range of deficits

that have been observed. A combination of broad and narrow theories, however, would appear to have better explanatory power.

There is much scope here for future research. One important area that needs to be resolved before the relative contributions of the competing theories can be fully assessed is whether the deficits that they claim to explain are specific to autism (see Chapter One for discussion of this). Findings from other research areas such as genetics, neuroanatomy and neurophysiology also need to be considered and integrated in future research initiatives. Currently there is a burst of interest in neuroimaging and research is underway at several centres to investigate neuropsychological functioning using functional imaging technology . These results should help to elucidate on the issue of whether neurobiological abnormality is at the level of widespread brain systems or discrete lesions.

It is also vitally important that future reseach allows for a better clarification on the issue of whether there are etiologically significant subgroups within autism. That this may be so has been indicated by the findings that subjects with and without speech have different patterns of familial loading (Bolton et al., 1994). Unless this issue is resolved it may be fruitless to consider a search for the underlying deficit - these may be diverse in number depending on the number of subgroups that it is possible to identify.

(2) WHAT IS THE ASSOCIATION BETWEEN DEVELOPMENTAL LANGUAGE DISORDER AND SOCIO-BEHAVIOURAL/EDUCATIONAL PROBLEMS

The evidence presented in Chapter 16 is by no means conclusive in what is a very complex and methodologically difficult area of study, but it provides interesting and important pointers. A number of the individuals studied here were found to have continuing difficulties

in social relationships as they grew older, despite having gained good language skills. These difficulties seemed to involve impairment in appreciating social cues, and also in modulating their social behaviour, and they persisted right into adult life. There was also much evidence of educational delays and of problems in the workplace. Furthermore, the data from Eales's pragmatic analysis revealed that the DLD group were showing deficits in their use of language that, although less than in the autism group, were nonetheless abnormal.

In Chapter One three different models were proposed to account for the relationship between the deficits in language and in the other areas of functioning. One of these suggested that a common antecedent might underlie all the affected areas. It has already been concluded[5] that factors such as temperament and psychosocial disadvantage are unlikely to be antecedents for the severe disorders of receptive language that are under discussion here. Neurodevelopmental delay as an antecedent, on the other hand, holds more explanatory power in accounting for the linguistic deficits and for some of the behavioural problems that may be found (Tallal et al., 1989), but lacks the scope to explain why poor peer relations should be so common in this group. Data are needed on other types of neurodevelopmental delay (e.g. perceptual-motor disorders) in order to investigate whether the pattern of psychosocial risk is related to the *neurodevelopmental* difficulties or to the *language* deficit per se.

A second explanation for the association between the areas of functioning might be that there is an underlying deficit in a purely linguistic process; the social difficulties arising as a secondary consequence of this language disorder. Possible routes that have been suggested are that difficulties in communication predispose to social rejection, teasing and isolation. A second route might be through scholastic retardation which in turn creates its own risk through low self esteem and poor self-image; these in turn influence behaviour

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[5] See Chapter One, p. 36.

detrimentally (Harter, 1983). These explanations seem on the face of it to be entirely plausible and they may well have some useful contribution to make. It is notable for example that several of the subjects in this study were the victims of cruel teasing; this did lead to their social withdrawal and at least in one case to a refusal to go to work. This does not seem to be the whole story, however, since a number of subjects did not experience teasing or social rejection and yet still lacked both friends and any apparent desire for more social contact. With regard to having a poor self-image there are few precise data available, but it is known that many of the subjects lacked mature concepts in a variety of areas (e.g. planning for the future, marriage, friendship and their own role in problems, see Table 10.6), and this might suggest that many of them would in turn lack a mature self-image. Data on the qualitative aspects of self-image in this group would be valuable in order to investigate how far this could explain their social difficulties.

A third possible mechanism might be that the language delay and the social impairments are both an intrinsic part of the language disorder. Earlier in this thesis (see pp. 27-9) there was a detailed consideration of the modular and interactive approaches to language development and this approach might be usefully applied here. Thus it is possible that if the language deficits and the social impairments do constitute an intrinsic part of the language disorder then the various areas may be interconnected, with all areas being affected to a greater or lesser extent when there is damage. It could be argued that the current data support this type of causal relationship since even those with better outcomes appeared to have subtle deficits in social understanding, and because so many had an apparent lack of desire for social contact. It is more plausible to explain these deficits as having fundamental origins than as arising from a linguistic deficit.

It was not possible to reach a conclusive decision over whether there was a real decrease in performance IQ between childhood and adulthood. If this was shown to be a true decline it

would be a further indication that so-called "language disorders" may be broader than language alone.

Further research in this area would be immensely valuable; in particular it would be useful to follow-up this same group of individuals in say their mid-thirties. This would provide further data on relationships and marriage, ability to work and work-related problems together with more conclusive indications of their ability to cope independently. Many of them in their mid-twenties were still living in the parental home and within this age range it could be reasonably argued that although unusual this is not abnormal. It would be more surprising, however, to find the majority of them living in these circumstances ten years later. It would also be likely that some parents would no longer be alive or would be unable to house their offspring and so it would be important to see how they coped when a protected environment was no longer available. At this stage more detailed data on subtle aspects of social functioning could be collected as well as on self-image and level of self-esteem. Also, it would be desirable to have a comparison group and this could be a general population sample or alternatively if it were possible, siblings of the subjects themselves.

The question remains of whether this group *needed* to have had such a poor educational outcome. They appear to have had a very mixed deal in terms of educational provision, and whilst many of them attended special language schools in their early childhood, the majority went on to attend ordinary schools or other types of schools where there was little recognition of their special need for speech therapy and language support. Haynes and Naidoo (1991) found that despite good early educational provision a group of young adults with severe developmental language disorders still had continuing language problems and a relatively poor outcome when folowed-up, although many had found employment. Despite attending a residential school for children with language disorders in the primary education years a large proportion of this group had gone on to normal comprehensive schools. This has

implications both for future research in that the effectiveness of different forms of educational provision need to be evaluated for children with DLD in order to determine how this group can achieve their full educational potential. There are implications too for the provision of services. There is a tendency to believe that once children acquire language they have no further need for support; this is clearly not the case and there is a need for at least some continuing support. Certainly many of the parents in this study expressed their frustration and disappointment at the lack of provision beyond the early years of education.

Also relevant to the provision of services, as well as to the classification of developmental language disorders, is the important finding that social problems are so frequently associated with the severe developmental language disorders. These are not generally recognised as being complications of the disorder itself, but it seems that this viewpoint should now be incorporated into the understanding of the disorder. The implications are several fold. Firstly a suitable place needs to be found in the classification structure for these types of disorders. 'Non-autistic pervasive developmental disorder' does not include any place for the types of social sequelae found in adults with this developmental disorder. Nor does 'atypical autism' really solve the problem since this group differ fundamentally from autism as well. The practical issues relating to education have been discussed above, but as well as teachers and key professionals being aware of the educational disadvantages that ensue for these children they need to be aware of the potential social difficulties that they might face. How therapy and education can best address these difficulties is an area that is ripe for research.

The issue of classification has been raised already and it seems that within the DLD group there might be meaningful subgroups; some seem to have had a more normal outcome than others, and yet others had unusual behaviours and social deficits. One question is which subjects in the current study would have been diagnosed as having semantic-pragmatic disorder had the term been in use at the time of the first study. Future research should

benefit from the improvements in terminology that have occurred in recent years, although it is clear from the last paragraph that the current framework does not adequately address all of the issues.

(3) HOW CAN OUTCOME BE PREDICTED IN DEVELOPMENTAL LANGUAGE DISORDER

It is rather a puzzling finding that so little appeared to predict general outcome in the DLD group. It *was* found that those with poorer verbal functioning in childhood found it harder to obtain and hold down a permanent job for any length of time however, which is an initial suggestion that language may be a good predictor of outcome. The lack of findings in this area may reflect both the heterogeneity of the group and the small sample size. Future research should aim to look at the role of other factors that were not included in this study (e.g. parental support) or could not be properly utilised because of the small sample size here (e.g. type of school attended).

The role of experiences in development also needs to be considered and this becomes possible if the interval between times of data collection in longitudinal research is not too long, as has been discussed earlier in this chapter. There was a hint in discussions with some of the individuals in this research that events such as a parent dying or unhappy experiences at school had profoundly influenced them, but these data could not be utilised in any effective manner as they were not collected consistently. Any future research on new populations would benefit from data collection at more time-points and a consideration of the effect of these types of life events on outcome.

(4) WHAT IS THE RELATIONSHIP BETWEEN AUTISM AND DEVELOPMENTAL LANGUAGE DISORDERS?

The data presented in Chapter 17 suggest that there may be closer links between the two disorders than has been previously thought. Certainly, the two groups look more similar than they did in either of the two previous comparisons. There are areas of difference, however, so that the predictors appear to be rather different, with language level in childhood being a strong predictor of outcome in the autism group, but no significant predictors being found in the DLD group. It is possible that the lack of predictors is a function of heterogeneity within the group, but it is difficult to be certain about this. There are also other areas in which the groups are rather different, thus the autism group in general have a more severe and widespread range of deficits, and are rated as being more odd on the socio-emotional tasks. Also, no cases of psychosis were found in the autism group, nor have most other follow-up studies found any, whereas 2 individuals in the DLD group developed schizophreniform psychoses in early adulthood. Despite these differences there was a large degree of overlap between the groups and in many of these instances the differences *may* be more quantitative than qualitative. For example, some members of the autism group were found to have quite severe social disinhibitions, whilst members of the DLD group also showed disinhibition but to a lesser degree. Whether they were different in quality or quantity is debatable and further research to look at these sorts of deficits in greater detail would be valuable. The issue of whether they differ in quality centres around 'functional specificity'. This has already been discussed above in relation to changes in the nature of a variable over time, but it is also relevant to consider whether a variable has functional specificity between different groups of subjects.

The finding that the groups appear more similar in adulthood than they did in childhood, coupled with the possibility discussed above, that the social deficits in DLD may be fundamental, poses questions about possible genetic links between the disorders. Bailey et

al., (1995) in their twin study of autism suggested that the genetic liability is for the development of a combination of specific cognitive and social abnormalities, with autism as the most severe phenotype. It seems possible that certain developmental language disorders might fall within this spectrum and further genetic research is necessary to investigate this question. There is a very limited genetic literature relating to developmental language disorders themselves but some reports have found a raised incidence of speech and language disorders amongst family members. As yet, however, there has not been a family genetic study that can assess the range and severity of any disorders in the relatives. Methodologically it would be very hard to do because the disorders are relatively rare. Nevertheless, if possible, it would be very valuable and might provide data to illuminate the puzzling question of why there should be an approximately equal sex ratio in the receptive disorders but a sex bias in the expressive disorders, and also in autism.

As well as clarifying where the boundaries lie between these two disorders, it is important to look at their relationships with other disorders that may be related (e.g. Asperger's syndrome). Some work has already been done in this area and Ozonoff et al. (1991), for example, found that executive function deficits, but not theory of mind deficits, were present in a group of adults with Asperger's syndrome. Further testing of these groups and of language-disordered groups, using neuropsychological and social-cognitive methods is needed, however, in order to be more conclusive about whether they show any of the deficits that people with autism have been found to show (e.g. in theory of mind, executive function and in other neuropsychological functions that might indicate weakness of central coherence).

Here too, as with other related issues it will become increasingly important to integrate findings from many different areas of research. Genetics and neuropsychology have both

been mentioned as having important contributions to make, but other areas including neuroanatomy, neurophysiology and neuroimaging may all prove valuable.

(5) WHAT IS THE PSYCHIATRIC RISK IN DEVELOPMENTAL LANGUAGE DISORDER?

Out of the sample of 20 boys with developmental language disorder two (DLD50 and DLD56) were found to have developed a florid paranoid psychosis in late adolescence. In addition there was one member of the mixed group (M4) who had done so. There were no such cases from amongst the autism group. It is well-known that some cases of schizophrenia are preceded by developmental problems, although not necessarily involving language (DeLisi, et al., 1991; Done et al., 1992; Hanson et al.,1976; Kolvin et al., 1971; Rutter and Garmezy, 1983), but it is not known what differentiates these cases from those that do not have a history of developmental delays. Data from a study such as this are particularly useful, since although it is relatively easy to obtain data about the incidence of schizophrenia, it is much more difficult to obtain reliable information about the incidence of developmental delays that may be related to the adult disorder. By the time a psychiatrist assesses the adult with a psychosis it is unlikely that reliable, standardized data would be available to confirm or disconfirm the earlier presence of a delay, and in all likelihood such events would seem irrelevant, being in the past and apparently resolved, and would therefore not be mentioned at all.

It has already been tentatively suggested elsewhere (Rutter and Mawhood, 1991) that the link with schizophreniform psychoses may stem from a genetic liability that underlies both and that there may be some risk added by prenatal/perinatal complications. Further research is clearly necessary in order to address this question and also the rather puzzling finding in this study and others (e.g. Goode, Rutter and Howlin, unpublished data; Volkmar and Cohen,

1991) that there does not seem to be any association between these types of psychosis and autism. There also remains the unresolved issue of the lead provided by Lewis and Mezey (1985) who found a cavum septum pellucidum on the CAT-scans of adults with schizophrenia and a history of developmental delays, including language impairments. Although this finding has not been replicated this may be due to the fact that the subjects who have been studied represent a different subgroup of schizophrenia (e.g. Jurjus et al. , 1993) . Further research in this area is needed as there appears to be some link between schizophrenia and certain types of developmental disorders, but as yet the nature of the relationship is very poorly understood.

IN CONCLUSION

In conclusion, it can be seen that this follow-up into adult life has provided new data that have gone a long way towards addressing the rather broad, issues it set out to investigate. The breadth and complexity of these issues means that many questions remain unanswered and new ones have been posed. It is clear that further research is vital in order to resolve fundamental questions. Thus, there are issues of classification that relate to both disorders and these in turn have important implications for the quality and comparability of future research initiatives. It is also crucial, and this applies especially to the DLD group where there has been little recognition so far of their social difficulties, to evaluate different methods of therapeutic intervention as well as to re-assess the suitability of educational provision and need for other services. Then there are the problems of how best to help these groups when they are no longer children. Much is written about both classes of disorder in *childhood*; much less in adulthood. Despite this apparent neglect it is clear that they still have continuing problems and are at the stage in their lives when they and their families have to face difficult and sometimes painful issues relating to independence and employability. At

present there appears to be little help available, especially for the language-disordered group.

There is much scope here for future investigation but studies need to be designed carefully in order to avoid the serious methodological problems that have dogged this field of research in the past. Longitudinal studies have a particularly important role to play here and should be valuable in helping to shed further light on the many absorbing issues surrounding these two diagnostic groups.

Appendix I

Centres providing initial contact with subjects

Departments of Child Life and Health; Psychological Medicine, and Speech Therapy, Royal Hospital for Sick Children, Edinburgh.

Nuffield Child Psychiatry Unit, Fleming Memorial Hospital, Newcastle-upon-Tyne.

Nuffield Centre for Speech and Hearing, London.

Children's Department, Maudsley Hospital, London.

John Horniman School, Worthing.

The National Society's School for Autistic Children, London.

Helen Allison School for Autistic Children, Gravesend.

Gade Valley Infant School, Hemel Hempstead.

Ewing School for the Deaf, Manchester.

Percy Hedley Centre for Spastics, Newcastle-upon-Tyne.

Appendix II

Vignettes of subjects excluded because of hearing deficits

Subject DLD3 had a bilateral sensori-neural hearing loss of approximately 60-80dB. He was living at home with his parents and worked in a small company belonging to family friends where he made window and door frames. He had held this job for four years and previously worked in a dockyard for three years where he was involved in ship repairs. He was made redundant from this job along with many other employees. His current employment seemed to be working out well but in his previous job he had been the victim of cruel teasing and was very unhappy. He signed with deaf friends but could also make himself reasonably well understood through speech. This was, however, full of grammatical errors and his utterances tended to be very short. He became frustrated a number of times whilst being assessed as he would often recognise a word but could not remember what it meant. He also had considerable word-finding problems in his expressive language. He could understand simple instructions but these usually needed some repetition. At the time he was seen he was quite unhappy and admitted to being very lonely at times. Locally he had no real friends of his own age, although he did keep in touch with a couple of old school friends who lived at some distance and he occasionally visited them in his car. Ships and lorries constituted a profound area of interest for him and he had pictures of them all over his bedroom walls, as well as collecting magazines about them. His parents said that this interest did not intrude on family life but *was* of an unusual degree. At the time of assessment he was aged 25 years 6 months.

Subject DLD5 was found to have a bilateral sensori-neural loss of approximately 70-90dB over the speech range of frequencies. He lived at home, had his own car and worked on an assembly line in an electronics factory, a job which was found for him by the Disablement Resettlement Officer at the local employment agency. He was 25 years 5 months at the time of assessment and had been in this same job for seven years without any significant problems. His speech was difficult to understand due to poor articulation and was composed

of short utterances with many grammatical errors. He could understand simple instructions if they were repeated several times and accompanied by gesture. He could sign and occasionally attended the local deaf club. Despite this he had no real friends, although he had one acquaintance whom he sometimes joined at the pub and his parents reported that he often complained of feeling lonely. He had never been on a date but a few years previously had a crush on a girl and tried to be in the same place as her whenever possible, to the extent that she eventually became frightened by him, although he had no intention of causing this reaction, and was puzzled by it. He had a very strong interest in Oliver Cromwell and arranged his holidays so as to be able to attend meetings of the Cromwell Society. At several points during the assessment he raised the subject of Oliver Cromwell and like Subject DLD3 his parents said that although the interest did not intrude on family life, as such, it was certainly of an unusually strong degree.

Subject DLD15 was found to have a profound bilateral hearing loss of approximately 95dB over the speech range. His speech was extremely limited and although he was using some single words he had no word combinations. He was able to sign fairly well, however, using the Paget-Gorman system which he had learnt at school. He was also making attempts to learn British Sign Language so that he could communicate better with other members of the deaf club that he attended regularly. He was living at home and working in a Remploy factory where he operated a printing machine. This had been his only job since leaving school and there had been no work-related difficulties of note. He had passed his driving test and had his own car. Most of his social life revolved around the local deaf club. He had several friends with whom he visited the pub at weekends and loneliness did not appear to be a real issue for him. He had never had a girlfriend although he expressed an interest in having one. There were no indications that he had any preoccupations, rituals or mannerisms and at the time of assessment he was 22 years 3 months.

Appendix III

Vignettes of subjects forming the 'mixed' group

The parents of Subject M1 were rather reluctant to participate in the study when first contacted as they said their son's state had deteriorated to the extent where it would be impossible to interview or test him. They did agree, however for a senior colleague of the author to interview them and to observe the subject. Their description was confirmed by this visit and although a very informative interview was obtained, no direct assessment was possible. Since the age of about sixteen Subject M1 appeared to have deteriorated. His parents described him as 'slowing down' considerably. At the time of the interview he was operating to his own timetable and this sometimes resulted in him being up for two days and nights and then going to bed for 24 hours or so. Everything he did was slowed to such a degree that baths, meals, visits to the lavatory etc., took hours. He was unable to talk, but could use about 50-100 Paget-Gorman signs, although he did not use them to communicate very meaningfully. He could only understand simple phrases after much repetition and in familiar situations, and any interests he previously held had disappeared. In certain situations he became very fearful and this was the case particularly when he encountered small animals such as dogs, and on visits to the dentist, where he needed a general anaesthetic before he could be examined. There was no evidence that he had suffered either hallucinations or delusions and he had not shown marked mood swings. Social overtures of any kind were negligible and his parents eventually allowed him to follow his own timetable and inclinations. He spent a lot of time cutting paper into small pieces and would search through wastepaper baskets to find paper that he could cut. He had occasional autistic-type hand and finger mannerisms and other stereotyped mannerisms. In summary, he had certainly suffered a definite and profound loss of interest. It is not clear, however, whether this was due to an actual loss of skill, although there were certainly things that he used to do and no longer did at the time of interview. He was aged 22 years 8 months.

The second member of this group, Subject M2, had done well, having been to university and successfully completed a science degree. After graduation he had gone abroad to teach and had at the time of contact held jobs in Japan and in Spain. His parents were very co-operative informants and were interviewed by the author. The proband, however, did not wish to be assessed or interviewed. He declined to give any reason, but it appeared that he was sensitive about his early problems and did not wish to be reminded of them. At the time of the informant interview he was aged 25 years 11 months. His parents described his language now as being entirely normal. His vocabulary and command of grammar were said to be very good, and indeed given that he had been teaching English, this appeared to be reliable information. His social life also sounded reasonably full and he had a number of friends with whom he shared a variety of activities, and in whom he confided. His father described him as a 'nice, gregarious person'. He had, however, never had a girlfriend and his parents did not seem to think that he had much interest in having one. Another of his father's descriptions likened him to a 'Victorian universal man' because he had such a wide range of interests. As well as reading very widely his interests included photography, languages, church philosophy, meteorology and collecting flora and fauna specimens. "He is interested in almost anything you care to mention" was his father's remark. There seemed to be a slightly odd quality about some of these interests, however. At one time, for example, he had the house arranged to record rainfall, sun time etc., and if he was away his parents had to do this recording at the same time each day. There was no evidence, however, of any other odd behaviours or rituals. Despite the obvious success of this subject in certain areas he had also suffered a number of setbacks. He tried for some time after graduating to get a job in the prison service but was not successful. As a result of this he decided to take a job offered by a church mission in Japan, where he taught the children of missionaries and expected to have his appointment renewed for a second year. He was very upset to find that this offer was not forthcoming and that he had been replaced without any explanation. After this disappointment he returned to England and took a course leading to a Diploma in Teaching English as a Foreign Language. Again he hoped to be invited to stay on for a second year, this time to pursue his studies further, but was not and was 'deeply hurt'. His

parents did not seem able to explain why he had met with these obstacles but his father did say that at times 'he seems to be slightly apart from the world and to be thrown by it'. It was only possible to speculate about the reasons behind the setbacks he had suffered, but it seemed likely that although he was bright and had done well intellectually, he was, nonetheless, lacking in sensitivity to certain situations.

The mother of Subject M3 was contacted but she declined to be interviewed or to allow her son to be assessed. It was known, however, that he lived in a residential home for autistic adults for a while but had left a few years previously and went to live with his mother where he attended a local Social Education Centre during the day. No further information on this subject was available.

Subject M4 had also deteriorated considerably and was at home with his parents when visited by the author. His mother was interviewed successfully but the proband refused to co-operate and no formal testing was done although it was possible to make some observations of his behaviour. He was 24 years 3 months at the time of interview and had, over recent years begun to suffer from a schizophrenic-type psychosis with prominent delusional ideas and thought disorders and he had also become increasingly withdrawn, rigid and obsessive. He tended to be aggressive and much of his talk concerned avenging his imagined persecutors. He had been given a CAT-scan a short while before the interview and this revealed that he had a cavum septum pellucidum . The combination of this, with the developmental abnormalities including language delay that he had shown in early childhood, and the emergence of a paranoid psychosis in early adulthood was in keeping with the possibly distinct diagnostic sub-group described by Lewis and Mezey (1985). The situation for this young man was, however, further complicated by a number of medical problems including a congenital heart defect and he unfortunately died as a result of this a few months after the interview.

Subject M5 was living at home with his mother and attending a Social Education Centre during the day. He was functioning in the mildly mentally handicapped range and appeared to be very suitably placed. There were a number of friends, made at the centre, with whom he often attended arranged social events and occasionally he would arrange to join them shopping or go to the pub. He also had a very close friendship with a girl who was another client at the centre. Every evening he would go to her house and her family included him in all family outings. He talked about getting married to her, but his mother was unhappy about this because she felt he would not be able to cope with the responsibility and did not understand the emotional commitment involved. There was no evidence that he had any preoccupations, but he was very ritualised and his mother described his whole day as a routine. He would become very anxious if the sequence of events was not adhered to. This had lessened somewhat in recent years but did still amount to something of a problem. He was also fairly resistant to change. His language was generally adequate to communicate his intentions but his speech tended to be very short and direct with few complex sentences. His comprehension was somewhat limited and instructions often had to be repeated several times before he could follow them through. One feature of note is that he had a bilateral hearing loss of approximately 35dB and was wearing bilateral post-aural aids when seen. At the time of interview he was aged 24 years 3 months.

Appendix IV

Derivation of Raven's Standard Matrices Deviation 'IQ"s.

To obtain deviation IQ's, percentiles were converted into IQ's following a table given in the Advanced Progressive Matrices (APMXIV) (Raven, 1983). Then the obtained IQ's and their equivalent scores were used to extrapolate IQ's for scores above the 95th and below the 5th percentiles. The relation between percentiles and IQ scores is not linear. To maintain the trends occurring at the upper and lower ends of the distribution, the IQ's for the scores above the 95th percentile were extrapolated on the basis of IQ's and scores between the 75th percentile and 95th percentiles, IQ's for the scores below the 5th percentile were extrapolated on the basis of IQ's and scores between the 5th and 25th percentiles.

Appendix V

PPVT Extrapolation

(a) Procedure

Extrapolation can be a rather hazardous process, since with no boundary values fitted, curves can go sweeping off to absurd values. To avoid this, a three stage approach was adopted that appeared fairly robust and seemed to give acceptable results. The approach is based on considering the surface as a series of age cross-sections each of which has a certain mean and dispersion.

Stage 1: *The relationship between standard 100 scores and age.*

A curve was fitted to the 77 values from the PPVT tables which correspond to the standard score i.e. using the raw scores as the independent variable and a polynomial in age as predictor. The r-squared for this was approximately 0.99. This can be thought of as a smoothed estimate of the raw score required at any age to get a standard score of 100. This raw score is referred to here as the reference score.

Stage 2: *Translating departures from these raw scores to departures from the 100 standard score.*

Standard scores were predicted by a regression equation with the covariates based on the following quantity: q = (raw score - reference score)/reference score. The covariates were q, q-squared, and the products of q and a quartic polynomial in age (i.e. 7 parameters including the constant). This was fitted to 26 points from the lower half of the PPVT Tables (i.e. standardised scores less than 100). The r-squared was 0.985.

Stage 3: *Using the stage 2 equation to determine the raw score necessary to obtain standardized scores below the minimum of the PPVT tables.*

The equation was used to provide a skeleton of values for the low scoring part of the surface not covered by the PPVT tables. This was then smoothly fitted to the boundary of the existing tables by manual linear interpolation.

(b) Table of Extrapolated PPVT Standard Scores

PPVT EXTRAPOLATIONS

Chronological Age

Raw Score	15.3 to 15.5	15.6 to 15.8	15.9 to 15.11	16.0 to 16.2	16.3 to 16.5	16.6 to 16.8	16.9 to 16.11	17.0 to 17.2	17.3 to 17.5	17.6 to 17.8	17.9 to 17.11	18.0 to 18.2	18.3 to 18.5	18.6 to 18.8	18.9 to 18.11	19.0 to 24.11	25.0 to 29.11
83																	39
82																	38
81																	37
80															39	39	36
79														39	38	38	35
78													39	38	37	37	34
77												39	38	37	36	36	33
76											39	38	37	36	35	35	32
75										39	38	36	36	35	34	34	31
74									39	37	37	35	34	33	33	33	30
73								39	37	37	35	34	33	33	32	32	30
72							39	37	36	36	34	33	32	32	31	31	29
71						39	38	36	35	34	33	32	31	30	30	30	28
70					39	37	36	35	34	33	32	31	30	29	29	29	27
69					38	36	35	34	33	32	31	30	29	28	28	28	26
68					37	35	34	33	32	31	30	29	28	27	27	27	25
67					36	34	33	32	31	30	29	28	27	26	26	26	24
66					35	33	32	31	30	29	28	27	26	25	25	25	23
65					34	32	31	30	29	28	27	26	25	25	24	24	22
64					33	31	30	29	28	27	26	25	24	24	23	23	21
63					32	30	29	28	27	26	25	24	23	23	22	22	20
62					31	29	28	27	26	25	24	23	22	22	21	21	20
61					30	28	27	26	25	24	23	22	21	21	20	20	19
60					29	27	26	25	24	23	22	21	20	20	19	19	18
59					28	26	25	24	23	22	21	20	19	19	18	18	17
58					27	25	24	23	22	21	20	19	18	18	17	17	
57					26	24	23	22	21	20	19	18	17	17			
56					25	23	22	21	20	19	18	17					
55	20																

Appendix VI

Weighted Kappa Coefficients for Items from Socio-Emotional Functioning Interview (Informant Version)

Item	κ_ω
Acquaintances	.68
Friends	.66
Concept of loneliness	.57
Level of teasing	.84
Heterosexual relationships	.67
Sexual behaviour	1.00
Feelings of love	.89
Leisure activities at home	.91
Leisure activities outside home	.91
Self-care	1.00
Use of telephone	1.00
Driving	0.65
Managing finances	0.71
Purchasing major items	1.00
Travel	0.84
Holidays	1.00
Concept of planning for a career	0.83
Understanding of why others get annoyed	0.78
Planning for the future	0.49
Frequency of job changes	0.70
Social problems at work	0.77
Display of annoyance at home/outside home	1.00

Appendix VII

Vignettes of individual subjects included in the adult follow-up

The descriptions given in these vignettes are not intended to cover every aspect of functioning in detail, but instead aim to focus on the particular abilities and areas of difficulty that these young men were experiencing at the time of follow-up, and to give a general impression of what they were like. In addition brief details of their functioning at Time 1 are included. The language age-equivalents cited here were derived from the Reynell Developmental Language Scales (RDLS) and the results of psychometric testing at all three time-points are given in Appendices XVI-XVIII.

For confidentiality reasons certain personal details have been modified. In no case, however, do any of these changes affect the substance of the description.

The Autism Group

Subject A1 was 7 years 8 months when first seen. Assessment showed his expressive language to be at the 5 year 7 month level whilst his comprehension was 5 years 4 months. At that time he showed a number of abnormal language features including pronominal reversal, echolalia, metaphorical language and frequent neologisms. A large percentage of his speech consisted of stereotyped utterances. His social functioning was markedly abnormal and he showed difficulty in adapting to new situations, quasi-obsessive behaviours and frequent stereotyped mannerisms. He attended a specialist school for children with autistic disorders, and at the age of 18 had moved into a small community home where he lived with several other adults with autism, all of whom were relatively able. By this time he could take responsibility for most aspects of his personal care, although he needed reminding

about some things, e.g. getting his hair cut. There was one able co-resident living in the home, and each of the residents took their turn at doing the cooking, shopping, etc. He could carry out various domestic chores quite capably, but would not be able to take the main responsibility for making sure they all got done when needed. When he was at home for the holidays his father felt able to leave him in the house alone during the day, but would not feel confident to leave him overnight. He was able to use the telephone competently, e.g. to make enquiries about cinema times, and he received a small personal allowance that he used for everyday needs. He was not able to take responsibility for major purchases, however. In using public transport he was quite capable; he often travelled independently and had occasionally had to cope with unexpected events such as cancellations. His speech was mainly grammatically correct, although it lacked any tonal variation, and he could give a report of events or activities provided probes were given to prompt him. It was also possible to converse with him to some limited extent, although again the other speaker would need to structure the conversation. He could usually understand and carry out 2-3 part instructions, e.g. 'go to the hall and get my gloves from the bottom drawer', and he could understand the plots of TV programmes and films provided they were not complex. He could write simple letters, although the content would be rather stereotyped, and he often looked at a newspaper. His father thought that he was mainly reading the headlines, however, and would find it hard to understand the content of the articles. He had a rather limited range of activities and his father summed up his 3 favourite activities as listening to records, visiting pubs (arranged by the co-resident at the flat) and 'just sitting snoozing'. Occasionally he would go to the cinema on his own if there was a film he wanted to see. His memory for detail was very good indeed and he recently got very annoyed because he could not remember what flavour ice-cream he had eaten in India when he was aged 3. His visuo-spatial abilities were unusually good and out of keeping with his general abilities, as defined in Chapter Seven. Socially, his manner was rather stilted, although he did sometimes try to strike up an acquaintance with someone in a pub. He had no real friends and despite joining in activities with the other residents in the flat, there was no particular sense of pleasure in their company and little spontaneous chat between them. He recognised he had a handicap

and that he was unable to do some things that other people could, but he had little insight into the nature of the problems and did not express any feelings of loneliness. His appreciation of humour was mainly for slapstick situations. Since leaving school he had been doing work experience in the local parks department. This mainly entailed helping to cut the grass. He was unrealistic about the sort of work he would be capable of doing and talked of becoming a pilot or an astronaut. Girls with long hair seemed to attract him, and when his sister had her hair cut short he would have nothing to do with her for some time. There were also complaints, whilst he was on holiday, that he had been going up to old ladies and stroking their legs. These behaviours, together with a number of crushes, were his only expressions of sexual interest and his father did not think he had ever had an erection. Watching horror films was a preoccupation and he often stayed up until very late doing this. He also had some compulsive behaviours e.g. when at home for the holidays he had to have breakfast on his own in the dining room with the door shut, and would get upset if not allowed to do this. There was a particular stereotyped movement that he would make several times a day. This involved shrugging his shoulder, shaking his head and hugging himself. His mother had died 1 year previously and his father felt he had become rather depressed as a result of this. During this time his behaviour had worsened and he had become more uncooperative than previously. He was aged 24 years at the time of follow-up.

On first contact Subject A2 was aged 5 years 10 months. His expressive language was at a level of 2 years 7 months, and his comprehension was at the 3 year level. Much of his speech consisted of echolalia. His social functioning was very limited and he showed marked instances of quasi-obsessive activities, stereotyped mannerisms and attachments to odd objects. When followed-up he was aged 22 years, was living at home with his parents and during the day attended a workshop for adults with autism. He needed help with minor aspects of self care but contributed to domestic chores by, for example, washing up, emptying bins without being asked and doing most of the family shopping. He would not be able to make any major purchases on his own however, nor could he manage travel other than any that was routine and local. In his spare time he would spontaneously initiate

different activities but had a very limited range, mainly painting abstracts, watching television and listening to music. He made few social overtures and those he did make were usually odd, e.g. he was very curious and might stare at people or touch them in a quite disinhibited way. At the workshop he would, to a limited extent, take part in some group activities but he had no close relationships and did not appear to desire any greater social contact. He attended a school for autism in early childhood, followed by a variety of schools catering for a range of different handicaps. At one of these schools he appeared to be very unhappy and had several catatonic episodes (see Chapter 13 for details). After leaving school at 16 he joined the workshop and had been there ever since. His speech was full of echolalia and stereotyped phrases and his utterances tended to be 2-3 words in length. He enjoyed the action in television programmes but did not appear to understand the plot, although he could understand and carry out 2-3 part instructions, if repeated. Very little of his speech was spontaneous and what there was sounded very 'mechanical'. He showed some awareness of girls and had chased several of his brother's girlfriends around the house and tried to hold their hands, but had expressed no other sexual interest. Doing the family shopping and painting amounted to preoccupations but although he preferred routine he could cope with changes of plan and he was not compulsive in his behaviour. He still had some unusual sensory interests, mainly smelling things, and his gait was odd.

When first seen Subject A3 was aged 6 years 3 months. His expressive language was at the 5 year 2 month level whilst his comprehension was assessed as being 3 years 10 months. Some of the early data for this subject are missing but it is known that his social functioning was poor. At follow-up he was aged 23 years and lived at home with his mother. He had no wish to move away from the comforts of home although his mother felt he could cope on his own if necessary, provided he was given a little guidance on paying bills. In every other way he was quite independent and could make major purchases on his own, travel long distances independently and had on several occasions organised his own holidays. His life was very full and varied and he organised all his activities himself. He went to classes in woodwork and Scottish dancing; sang in a male voice choir; visited elderly people; played badminton;

gave clarinet lessons to a neighbour; went to football matches; read the evening paper and wrote his own songs. He was talented musically, had a good voice and had given solo musical performances at local churches. Although in the past he had found it difficult to appreciate other people's pleasure, his mother said he had in recent years become much better at entering into the 'spirit of an occasion', and now, for example, enjoyed other people's birthdays and not just his own. He was able to make acquaintances fairly normally and would ask other people about their interests rather than just talking about things he was interested in. Recently he had taken part in an Interview Skills course for the unemployed which had entailed watching himself on video. This had apparently helped him to modify various of his behaviours and to think about social skills. There was a slightly studied quality about his interaction, so that it felt a little bit as though he had been trained to ask other people about their interests but nonetheless he did cope quite well socially. He had two close friends, made through this course, and he shared a variety of activities with them. His mother described one of them as 'a very odd character' and the other as 'very withdrawn' but they seemed to have fun and to enjoy one another's company. They also confided in one another to some extent. He might occasionally still say tactless things but he could also recognise tactlessness in others. His sense of fun was well-developed but he would tend not to understand some of the more subtle aspects of humour, unless they were explained to him. At times he would try to be humorous, e.g. by putting on different accents, but his mother described these attempts as rather embarrassing. He still found it quite hard to accept any sort of teasing as he tended to be rather literal. If someone said 'your sister is ugly' in a teasing way he would get upset because he would find it hard to recognise that they didn't mean it. He had attended a number of different types of school, ranging from a normal comprehensive to a boarding school that specialised in taking 'difficult' children. After leaving school with Music O'level he completed a Music foundation course but had to abandon further study in this area as he did not have enough formal qualifications. He had several short-term jobs working with elderly people but eventually left this area of work because he did not like the unsociable hours, and although he passed the Civil Service test he did not interview well and was not offered a job. At the time of follow-up he was just

about to start a job reading newspapers for blind people. His mother said it had been to his advantage to be interviewed by blind people because they could not see his slightly odd and rather over emphatic hand-rubbing. His speech was appropriate for his age now; he was able to give a reasonable account of activities and he could converse well. He could understand most plots on television or in films, although he tended to miss some of the more subtle references. His mother gave the example of having to explain that one of the characters in a TV programme was a prostitute when all she had said was 'I was standing on the street corner with the other girls' and he had taken this literally. He was able to read very well and his articulation was very clear, both of which had helped him to get the newspaper-reading job. His appreciation of the problems that he had experienced was fairly realistic and he had sufficient insight to realise that some people might still find him rather odd. Nonetheless he also thought, probably quite realistically, that most people he came across liked him. He had one relationship with a girl that had lasted for over a year. His mother said that although she was 'very pleasant' she had some problems herself. She was rather overweight and had a very poor self-image. They were apparently very fond of one another and went on holiday together, although they had separate rooms and did not ever sleep together. His mother said this was because they were both 'quite religious'. Nonetheless they would kiss and cuddle and were reported to be quite physically demonstrative. He eventually ended the relationship because of her possessiveness, but said he would like another girlfriend 'if the right one came along', and hoped one day to get married and have children. He did not appear to have any compulsive or ritualistic behaviours.

Subject A4 was aged 10 years 5 months when first seen. His expressive language was above the 6-year ceiling on the RDLS and his comprehension was at a level of 5 years 8 months. His speech had a number of abnormal features with pronoun reversal, echolalia and frequent repetition of his own phrases. His social functioning was very limited and he made no approaches to other children. He was slow to adapt to new situations and he showed marked stereotyped hand and finger mannerisms. At follow-up he was aged 26 years and was living at home with his parents. He needed a lot of help with self-care and was only able

to do routine washing and toileting independently. He did not ever go out on his own or travel independently. In his leisure time he would spend hours looking at the television, or books on James Bond or the Royal Family. He was very knowledgeable about both these subjects and preoccupied with collecting information about them, to the extent that family life often had to revolve around these interests. He was also very good at doing jigsaw puzzles. Sometimes his behaviour was socially embarrassing, and he lacked any sort of awareness or responsiveness to how other people were feeling, and made no social overtures beyond those needed to get his personal demands met. Many things annoyed him, e.g. people looking at him or some change of routine. When he got angry he would walk up and down in the road and on one occasion hurled the television to the floor in a rage. He had attended a school for severe learning disorders, and after leaving went to a Social Education Centre where he had been ever since. His grammar was immature and lacked complexity and he was occasionally echolalic and used stereotyped phrases. He often talked to himself and recited things from memory, e.g. his father had recently heard him reciting whole pages from a biography of Henry Cooper he had been reading. In most circumstances he could understand and carry out 2-3 part instructions very well. Although he enjoyed going to the cinema and could recall all the action he did not link it together into a story. He had little or no reciprocal conversation or chat, and used language mainly to ask for things or in response to questions. He also had slight articulatory difficulties and a mechanical-sounding voice. A lot of his behaviour was compulsive in quality, e.g. when getting undressed for a bath he took each item of clothing off and stood for 5 minutes before taking the next item off. It had to be done this way or he would become very upset. He was also very resistant to change and had some verbal rituals and vocal tics. Hand mannerisms and stereotyped body movements were frequent, and he had not ever expressed any sexual interest.

Subject A5 was aged 6 years when first assessed. His expressive language was at the 14-month level and his comprehension was below the 6-month basal level on the RDLS. His social functioning was markedly limited and he showed some quasi-obsessive activities, as well as stereotyped mannerisms and difficulty in adapting to new situations. At follow-up he

was aged 22 years and was living in a residential home for people with autistic disorders. Although he could wash independently, he needed help with other areas of personal care, and needed reminding to change his clothes, for example. He could not use the telephone independently and did not have any notion of the value or purpose of money. In his spare time he had a limited range of activities, including looking at slides, listening to music and making Lego buildings, and his mother reported that when at home on holiday, he would do the same activity day after day, without appreciable organisation. He was also very interested in collecting rubbish, so that on a walk he would spend ages picking up bottle tops, bits of paper etc. His memory was very good for all sorts of details and his visuo-spatial abilities were found to be unusually good and out of keeping with his general abilities, as defined in Chapter Seven. He was, for example, very good at doing jigsaw puzzles and could do them just as well with the picture face down, as with it showing. Most of the time he showed little interest in other people, but occasionally he would ask to go to tea with several neighbours of his parents, who had in the past been kind to him. He would notice if his mother was very cross but mostly showed little awareness of other people's emotions. Nor did he have any apparent understanding of humour, and his range of facial expression was very limited. He was markedly disinhibited and was also hypersensitive to having his wishes frustrated. If he was angry he would hit out at whoever was near, and had little understanding of his own role in causing annoyance. He mainly communicated using single words and his only gesture was pointing, which he did in a rather stiff and awkward way. His eye contact was inconsistent and he often used echolalia. He talked to himself in public and referred to himself by name. In some circumstances he could understand simple instructions, but he often got part wrong, e.g. if asked 'go up to the bathroom and get my duster' he would be likely to go to the bathroom but might come back with the wrong item. His mother felt that he had some sexual feelings and he had occasional wet dreams but there was no other sexual expression or interest in girls. At various times in the past he had been prescribed both Haloperidol and Melleril and still had a number of behavioural problems. He was very compulsive about many things, e.g. lining up his slippers in a certain way, eating food in a particular order, and his mother said he made anyone he lived with

'slaves to him'. Any outing he went on tended to be disrupted by his compulsion to go on any lift or escalator that he saw, and he was attached to a variety of different objects including balloons and mirrors. In the past he had been extremely resistant to change, this had now lessened somewhat but he still had a strong preference for routine. He also had episodes of pica, frequent stereotyped hand and body mannerisms, tics and occasional vocal tics. His gait was very odd and he pulled out his hair quite frequently. As a child he had been very overactive, then in adolescence he became underactive and he was still somewhat lacking in vitality.

Subject A6 was aged 9 years when first seen. His expressive language level was 2 years 5 months, whilst his comprehension was at the 2 year 6 months level. His speech predominantly consisted of single words although he sometimes used stereotyped utterances. He had no friends and did not make approaches to other children or join in with group activities. He had great difficulty in adapting to new situations and showed frequent stereotyped mannerisms. At follow-up he was aged 26 years and was living in a residential home for people with autistic disorders where he had been for over ten years. Although he could take some responsibility in caring for himself, (e.g. he could dress himself), he needed help with shaving and washing his hair. He had never used the telephone or travelled independently, nor did he have any understanding of the value of money. It was not possible for him to go out on his own, unsupervised, as he was inclined to bolt if he saw a cat. He had little curiosity about things around him, and if left to his own devices would do the same activity for hours on end. According to the definition given in Chapter Seven he had exceptional visuo-spatial abilities. Other people were of very limited interest to him and he lacked any apparent awareness or appropriate response to how they might be feeling. His facial expressions were frequently inappropriate and were very limited in range. He was also very socially disinhibited. Most of his utterances were single words, although he did use the occasional 2-3 word phrase. His speech was very repetitive and often echolalic, and his eye contact was poor. He could understand simple 2-part instructions, but had very little spontaneous speech. When he did speak his articulation was clear but his voice lacked tonal

expressiveness. His parents reported that he had never expressed any sexual feelings. He was very resistant to change, becoming irritable if his routine was altered, and he had frequent stereotyped mannerisms as well as an odd gait and frequent rocking.

Subject A7 was aged 4 years 9 months when first seen. Both his expressive language and comprehension were at the 3 year level and he showed some evidence of abnormal language features, especially pronoun reversal. Some of the data on language functioning and quasi-obsessive and ritualistic behaviours are missing for this subject but it is known that his social functioning was very poor. When followed up he was living in a residential home for people with autistic disorders and was aged 22 years. He needed a little guidance with self-care but otherwise could take care of his personal needs fairly independently. Although he could use the telephone to ring his parents he could probably not cope with wrong numbers or other unexpected events. He managed his pocket money sensibly, and was able to go on the bus to a nearby town, provided no changes were involved. His interests were rather limited in range and were usually initiated by the staff. He particularly enjoyed going riding at a nearby Riding for the Disabled centre, and he liked collecting stones, but not to the extent of being preoccupied. He was good, but not outstanding at mental arithmetic and drawing and had an exceptional visuo-spatial ability (as defined in Chapter Seven). He showed definite pleasure in seeing his parents but made very few social overtures, unless they were for personal demands. Although he quite liked to be around people, and would join in to a limited extent with some group activities, he tended to prefer his own company and did not ever appear to be lonely. He showed some responsiveness to the feelings of others, although his facial expression was sometimes inappropriate for the situation (e.g. smiling when talking about someone having died), and was aware if annoyance was shown towards him, or if he was teased - and did not like it. During the day he worked in the workshop attached to the residential home. His use of language was largely correct and he made good eye contact when speaking. He did not watch very much television but understood the plot when reading comics provided the humour was not too subtle, and wrote down stories that he had made up, as well as composing simple crosswords. He could join in

a conversation and give a reasonable report of events or activities although the other person might need to give prompts to keep it going. His speech sounded rather odd with an over-emphatic quality. Although his parents said that he did masturbate sometimes he did not express any interest in girls. He was flexible with regard to changes, but had occasional stereotyped hand mannerisms. He had no real concept of the future and little insight into his difficulties.

When first assessed Subject A8 was aged 8 years 3 months. His expressive language was equivalent to 4 years 11 months and his comprehension was 4 years 3 months. His speech was frequently echolalic and stereotyped and he showed a number of abnormal language features including pronoun reversal, metaphorical language and odd intonation. His social functioning was very limited and he also had difficulty in adapting to new situations. Much of his behaviour was ritualistic and he had frequent stereotyped hand and finger mannerisms and quasi-obsessive activities. When followed-up in adulthood he was living in a residential unit for adults with autism. He could undertake some aspects of self-care independently, but needed reminding to change his clothes, for example. Although he initiated telephone calls to home, he could probably not use the telephone for calls other than to his family. He had some idea of the value of money, but only had responsibility for his pocket money, taking no initiative for purchases such as clothes and not recognising when new items were needed. Provided only one connection was needed he could manage local travel, but would not be able to cope with unexpected changes of plan or events if he was out on his own. His range of activities was rather limited and mainly involved listening to records and reading magazines about buses. Apart from these, his other main pastime involved superimposing new roads onto actual maps and naming them. He would then talk about an imaginary family who lived in these roads and tended to do all the things that he knew to be wrong. Although he was aware of the obvious signs of someone else being upset and did not like it, this tended to be because of the way it affected the atmosphere and impinged on him, and he showed little evidence of emotional reciprocity, or awareness of his own part in causing annoyance. His memory for dates and things of interest to him, e.g. the London bus system,

was described as extremely retentive and infallible. He also had a very good use of perspective in drawing and a good ear for music. It was very rare for him to initiate social contact and although he shared activities with the other residents he showed little apparent pleasure in their company and he tended to prefer to be on his own. He was occasionally socially naive, but was aware of the need to behave differently in certain situations, e.g. being quiet in church. During the day he attended a workshop attached to the centre. His speech was fairly simple and his utterances tended to be short and to the point, with errors of tense. He still had occasional echolalia; his speech sometimes sounded stereotyped and he also had persistent you-I pronoun reversal. Overall, he had very little spontaneous speech and his utterances were very lacking in tonal expressiveness, and rather slow. He seemed to be unaware of being different or of having any problems, and he did not express any sexual interest of any sort. Although he preferred things to stay the same he could, if necessary cope with change, and he did not have any compulsive behaviours. He was especially interested in buses, but this did not really amount to a preoccupation. His mother and father were first cousins and he had one sister, who although not autistic was reported by the parents as having problems 'getting on with people' and as having a 'remarkable lack of empathy'. He was aged 25 years.

Subject A9 was aged 5 years when first seen. Both his expressive language and his comprehension were below the 6-month level on the RDLS. He made no social overtures and had difficulty adapting to new situations. He had marked attachments to odd objects but no quasi-obsessive activities or rituals. At follow-up he was living in a long-stay mental handicap hospital and was aged 22 years. He could have a bath and dress himself without help, but needed assistance with other aspects of personal care such as shaving, and he wet his bed most nights. He had no idea of the value of money and was not able to use a telephone. During the day he attended a day centre attached to the hospital, and if left to his own devices would sit and do nothing. He had little curiosity and did not initiate any social interaction, or show particular pleasure in anyone's company, although he would respond by saying 'hello' if someone else initiated the contact. His range of facial expression was

somewhat limited and his expressions were sometimes odd or inappropriate. There was no evidence that he had any understanding of humour, and he was quite disinhibited, so that during mealtimes he might reach across the table and take food from other peoples' plates. He could follow spoken instructions involving sequences of at least two actions e.g. 'go to the box and bring me the ball', if in familiar contexts and given frequent repetition, and he could use two-word combinations such as 'more drink'. He very rarely used speech or gesture, however, and could only be understood by people who knew him well. He could recognise a number of signs such as those for 'Ladies and 'Gents' toilets. Most of the time he was fairly co-operative, but had quite recently shown some bouts of violent and aggressive behaviour and had been put on tranquillisers because of this. His mother said that he had sexual feelings, and did masturbate but without any specific focus. He did not mind changes of routine and he did not show any evidence of ritualistic or compulsive behaviour.

Subject A10 was aged 9 years 8 months when first seen. His expressive language was at the 2 year 9 month level and his comprehension was assessed as being equivalent to 3 years 1 month. The majority of his speech consisted of echolalia and stereotyped utterances and his intonation was odd. Socially, his functioning was very limited and he showed a lot of quasi-obsessive activities. There was also some evidence of ritualistic behaviour and some stereotyped mannerisms. When seen in adulthood he was aged 25 years and was living in a residential home for people with autistic disorders, but talked constantly of getting a flat and living independently. This was a wholly unrealistic desire as he had no idea how to achieve it, and would not be able to cope on his own. Although he was able to manage most aspects of self-care independently, and could use the telephone to ring his family, he could not cope if unexpected events, such as a wrong number, occurred. He managed his own pocket money, but did not really understand the value of money beyond these small amounts. Despite never having had a driving lesson he once took his brother's car and was sufficiently aware of the skills required that he managed to drive it some way before he eventually crashed it. He was not normally ever allowed to travel anywhere independently. In his leisure time he showed some variety, writing his diary, watching television selectively and

listening to his collection of tapes. When at home on holiday he spent a lot of time in the garden shed, and had initiated and carried out a number of useful practical projects without help, e.g. putting up shutters on windows and installing lights in the shed. His mother reported that he did not really join in with any family or group activities, preferring to be either on his own, or on the fringes of the group. He had a very good memory for dates and events, and also a very good visuospatial ability that was defined as a special talent according to the definition in Chapter Seven. Socially, he was very limited and mainly made social contact in order to get his personal needs met, although he might occasionally ask someone their name. There were a few members of staff at the home that he showed some preference for, but he had no friends with whom he shared activities, and appeared not to want any greater social contact. He might be aware of how someone else was feeling if there were very obvious signs such as crying, and he might change his behaviour slightly, in accordance. Generally, however, he lacked normal social inhibitions and did not modify his behaviour in different contexts. His mother felt that he did, to some extent, understand why others became annoyed with him, although it sometimes took him a while to appreciate that they were annoyed. During the day he worked in the garden or workshop at the centre. His grammar was immature and limited in complexity. It tended to be repetitive with little use of tense and a lot of stereotyped phrases. He also used neologisms sometimes, e.g. he made up his own names for different types of hairstyle. He also referred to himself by name rather than using 'I'. Although he could understand simple 2-step instructions he could not follow the thread of a story. In any interaction he tended to follow his own dialogue, rather than having a conversation, and he had little spontaneous speech. His voice showed little tonal expressiveness and was rather jerky. He would sometimes fill in coupons for special offers and send them off on his own initiative, but other than that he did not write very much. Apart from occasionally talking about female members of staff he showed no other evidence of sexual attraction or feeling. Although he preferred routine he was not obsessive about this and he did not have any compulsive behaviours. He was quite preoccupied with his tape collection and his wish to get a flat, and he had occasional stereotyped hand and finger

mannerisms. He realised that he was different from his brothers, and had said on several occasions 'I'm sad, my brain won't work'.

Subject A11 was aged 9 years 8 months when first seen. His expressive language was equivalent to 2 years 11 months and his comprehension was at the level of 3 years 9 months. His mean length of utterance was 4 words. Much of his speech was echolalic or stereotyped and he also showed some pronoun reversal, metaphorical language and neologisms. His social functioning was very limited. He was resistant to change and slow to adapt to new situations. He also showed marked attachments to odd objects, quasi-obsessive activities and some ritualistic behaviour. At follow-up he was living in a residential home for people with autistic disorders. He needed major help with all aspects of self-care and took little or no responsibility for decisions. Although he could, for example, dress himself, the clothes needed to be chosen and put out for him. He was unable to use the telephone, or to travel independently, but could manage his 'pocket money' reasonably well. In his leisure time he would do the same activity for hours on end without any appreciable organisation, especially large-scale jigsaw puzzles which he loved, and often did with the picture face down, since he seemed more interested in the shapes of the pieces than the picture. He made no social overtures of any kind and his father reported that once whilst on holiday in Greece he had got into difficulty in the swimming pool. Even though he was almost drowning he did not shout to attract attention. He showed no particular pleasure in anyone's company and had a very limited range of facial expression. On occasion he had been teased and was aware enough of this to get upset. Up until 10 years ago he had spoken in sentences but gradually his speech reduced and it was now very difficult to get him to say even 'yes' or 'no'. If asked a direct question he might give a single word response in a tiny whisper, but he no longer spoke in sentences at all. He did not use gesture and did not understand pointing. His eye-contact was limited and he tended to look briefly at the speaker and then down at the floor. It was possible for him to understand simple instructions, and he might enjoy the action on television but had no understanding of the thread of a plot. He could write simple messages, e.g. on a postcard when on holiday, if they were dictated, but

could not compose spontaneous messages himself. As his language deteriorated his behaviour was reported to have improved. He used to be very compulsive so that family life had to be organised to accommodate it, but although there were still elements of compulsion such as wanting to touch all four corners of a table, this was no longer disruptive. Also in the past he had been very overactive but was now quite underactive. Almost all his movements were stereotyped. He did not show any sexual interest although his father said he did masturbate. At the time of follow-up he was aged 26 years.

Subject A12 was aged 9 years 4 months when first assessed. His expressive language and comprehension were both assessed as being equivalent to 3 years 2 months. The majority of his speech consisted of stereotyped utterances and he had rather flat intonation together with occasional echolalia and neologisms. Socially, his functioning was very limited and he showed some quasi-obsessive and ritualistic behaviours, as well as stereotyped mannerisms. When followed-up he was living in a small privately-run hostel catering for adults with mixed learning disorders. He had previously lived in a residential home for people with autistic disorders, but had been asked to leave after he had thrown boiling water over another resident. He had been in his current home for 2 years and seemed much happier. Although he took quite a lot of responsibility for his personal care he needed guidance on when to get his hair cut, for example. He took some part in the domestic chores of the house and could Hoover or wash-up if asked to do so, and he took the initiative for keeping his own room tidy, but did not ever use a telephone, travel independently or have any concept of money. In his leisure time, if left to his own devices, he would spend hours on end looking through old photographs. He also liked listening to records and doing jigsaw puzzles. He was very good at these and did not make any use of the picture in doing them, concentrating instead on the shapes of the pieces. His memory was very good for details of events and he also had a very good sense of direction. A particular area of talent was drawing and he did sketches from memory, making very good use of perspective and correct in tiny details e.g. the number of seats in a row in a sports stadium. He showed little interest in people, and his social overtures were limited and often inappropriate. Although he joined

in with activities such as going out to the pub with the other residents, he rarely talked to them and did not show any particular pleasure in their company. He had few facial expressions and these were often inappropriate e.g. smiling in sad situations. Despite the aggression he had shown at times when in his previous home there had been no episodes of this since coming to his present accommodation. During the day he attended a Social Education Centre. His speech was usually composed of phrases he had learned, strung together so that they sounded stereotyped but nonetheless had some appropriate content e.g. 'I had a cup of coffee at school last Tuesday night'. Occasionally if he could not find any other way of expressing himself he would draw a picture. His eye contact was poor. He had some echolalia, and occasional 'you-I' pronoun reversal. He also talked to himself a lot. He could usually carry out 2-part instructions but would have difficulty understanding anything more complex than that. When he watched television he enjoyed the action, especially sport, but could not follow a plot. He asked very few questions and had little spontaneous speech unless it was to make a request. His speech was slow and expressionless but his articulation was clear. He had not ever expressed any sexual interest and his mother did not think he had ever had an erection. He was less compulsive now than he had been in the past, but he still had particular ways of doing most things and would get distressed if he had to change. At times he would still sniff things inappropriately, but this behaviour was less frequent than in the past. His way of going upstairs was also rather odd, and was described by his father as 'Regency-style with a sweeping turn on each stair'. He appeared to have benefited from being in a mixed environment, and his behaviour had improved as he was not picking up mannerisms from other people with autism. He still liked to be on his own a lot but could also cope with being in company better than in the past. He was aged 25 years.

Subject A13 was aged 4 years 10 months when first seen. His expressive language was at the 18-month level and his comprehension was equivalent to 2 years 8 months. The majority of his speech was echolalic and consisted of single words. He had marked gaze avoidance and little interest in social interaction. A lot of his behaviour was ritualistic and he had some quasi-obsessive activities as well as stereotyped mannerisms and had a number of

attachments to odd objects. When followed up he was living in a sheltered flat on an estate run by Social Services for mildly handicapped individuals, and working in a sheltered factory. This was in Belgium where he had gone to live with his mother when she had remarried. Although he had learned to speak Flemish and could converse in it, he had always found it difficult to settle there and he had something of an obsession about wanting to return to England. In all aspects of self-care he was independent; he could use a telephone; manage his income sensibly; often travelled independently and rode a small motorcycle competently. This was of a type that did not require a driving licence in Belgium. He could follow and carry out 2-3 part instructions and could follow the gist of a plot on television, or in a book, although he would probably miss any aspects that were subtle or complex. He had some difficulties with expressing tenses correctly and his vocabulary was somewhat limited e.g. he did not understand the word 'extension'. Although he could give a report of events this might be rather piecemeal and he would need encouragement to keep it going. Likewise, it was possible to have a conversation with him but this might be rather stilted or limited, or he might, on the other hand, talk non-stop about things that were of interest to him. His speech often sounded rather stereotyped but he was no longer echolalic. It was also lacking in emotional expressiveness, although his range of facial expressions was fairly normal. Some things did amuse him, but his sense of humour was often rather immature or inappropriate, and at times he could be a little socially disinhibited, e.g. when at a wedding recently he had grabbed his own food ahead of other people. His range of interests was somewhat limited but he did take the initiative for organising them. One of his favourite activities was writing letters, either to public authorities in England to try and set up a placement to move to, or to various individuals and organisations in an attempt to trace people he had once known, e.g. at school. He was very systematic about doing this, and had been successful with a number of contacts. The main problem he had in writing letters was that he found it difficult to structure them in terms of an appropriate beginning, middle and end. He would occasionally look at strip cartoon books on his own initiative, but apart from this showed little interest in reading books. Once a week he took part in a sports activity such as jogging, or ski exercises and he also spent time making models. His memory for past events and dates

was exceptionally good. Everywhere he went he would strike up acquaintances, e.g. at bus stops, and would deliberately not wear a watch so that he could ask them the time, as a tactic for starting a conversation. Although he enjoyed talking to family friends he tended to focus on his preoccupation with moving to England. Older people tended not to mind this, but he had learned how to express an interest in other people, and whilst at first this had sounded as though he was merely repeating a formula, it was now with practice beginning to sound more natural. He had no close friends with whom he shared any interests or confidences, although when he visited England he would call all sorts of people that he had known in the past and arrange to meet up with them. These could not really be called 'friends' as he had very much lost touch with them. He had contacted Subject A15, who had been at school with him when they were both aged about 7, in this way and he had come over to Belgium for a visit. This had not really worked out because he had planned what they were going to do together in great detail and when A15 did not want to do what he had organised he found it difficult to negotiate. One of the trips he had planned was to see his old teacher, who was clearly of limited interest to A15. He did not ever say he was lonely although he would often hang around without any sense of purpose and say 'I've got no-one to go and see'. He had on several occasions had crushes on pretty girls, but these were not very intense and he never seemed to be very bothered when they did not respond to his advances. His range of facial expressions was quite wide but he would often make odd faces or smile to himself. He had some understanding of his own role in causing annoyance, but this was often limited or attributed to external factors outside his control. His main preoccupations were wanting to return to England and trying to avoid germs, but these did not intrude on family life. Similarly he preferred routine but would adapt if necessary and was not compulsive in any of his behaviours. It was often difficult for him to appreciate the consequences of an action, e.g. if he ran out of petrol whilst riding his motorbike he would switch to the reserve tank but would need reminding that once this ran out he would be completely out of petrol. He managed to cope with his job quite well and the main obstacle to him taking on a more demanding job would be his inability to take any initiative. He was aged 22 years.

Subject A14 was aged 5 years 6 months when first seen. His expressive language was assessed as being 14 months and his comprehension as 2 years 6 months. His speech consisted of single words only and these were often echolalic. His social overtures were very limited and he had a number of quasi-obsessive and ritualistic behaviours, stereotyped mannerisms and also a marked resistance to change. When followed-up he was aged 22 years and living at home with his mother. Although he could carry out most aspects of self-care himself he often needed reminding, e.g. to shave or wash his hair. He could prepare simple meals, and would take the initiative for clearing up if he made a mess, but other than this he took little part in domestic tasks. He was not able to travel independently and he did not understand the value of money. His mother felt able to leave him in the house on his own for short periods, but he found it difficult to cope with answering the telephone or knowing what to do if a stranger came to the door. He had attended a school for physically-handicapped children and had been the only pupil there with autism. Since leaving this he had attended a local Social Education Centre. In his spare time he had a few interests which he would initiate spontaneously, mainly playing records looking at photos and watching videos. He was very talented at drawing and made very good use of perspective. His drawings were always still life copies or portraits, however and he did not draw from his imagination or memory. On one occasion a member of staff at his day centre sat so that he could do a portrait of her, and after she had been there for 2 hours all he had done was the very top of her head; he found it more important to get the precise details of the wallpaper behind her. Apart from his ability at drawing he had a very good memory for details, such as dates and events. He showed little interest in people, preferring to spend his time alone, and rarely initiated social contact. The only exception was that he had taken a special liking to a female member of staff at his centre. He was very upset when she left and this, together with the noisy environment, had seemed to trigger off a serious bout of behavioural disturbances and depression that had resulted in him being excluded from the centre whilst his case was considered. The previous year he had started wearing headphones a lot and putting his fingers in his ears. Despite always being even-tempered in the past he started having bouts of destructiveness and aggression, grabbing people, throwing furniture through

windows and on one occasion putting his own foot through a window. This was accompanied by hyperactivity, and he would stay up all night throwing Lego bricks out of the window, giggling and recording the noise. He also cried a lot at this time and was prescribed Melleril and Diazepam. He was sometimes aware of the obvious signs of how someone else was feeling, e.g. if his mother was crying he might give her a quick hug, but if she was sad and rather quiet he would not notice. He could, to some extent, modify his behaviour according to the situation so that, for example, he knew he should not whistle in church, but he was also quite socially disinhibited in other situations e.g. if someone was having a fit at his day centre he would stand and stare. His speech tended to be either single words or telegrammatic phrases, e.g. when talking about his forthcoming holiday he said 'holiday 3 weeks, caravan, sleep in caravan, take sleeping bag', and it contained a lot of echolalia, repetition and stereotyped phrases. He would point if necessary, although he used no other gesture, but his eye contact was quite good. His level of comprehension extended to understanding simple 2 part instructions. Apart from his attachment to the member of staff he had shown no interest in girls or any other sign of sexual interest. He preferred routine but did not usually get upset if this was changed. When he was 16 he became very lethargic, so much so that he once fell asleep in the swimming pool. Although he had become hyperactive during his recent behavioural disturbances his mother reported that he was beginning to get lethargic again. He had occasional hand mannerisms and often walked on the balls of his feet.

At the time of the first comparison Subject A15 was aged 5 years 9 months. His expressive language was at the 3 year 8 month level and his comprehension was 3 years 11 months. A lot of his speech consisted of stereotyped utterances and he also showed pronoun reversal. He had no friends and his social overtures were limited. He was slightly resistant to change and he had some ritualistic behaviours, quasi-obsessive activities and stereotyped mannerisms. At the time of follow-up he was living with his parents and was quite happy to do so as he had sufficient insight to realise that he would find it difficult to cope with the responsibility of running his own home. He was able to care for himself independently, however, and would, for example make an appointment to have his hair cut or to see a

doctor without any assistance, and as the need arose. Although he was able to undertake most household chores his mother tended to do most of these for him as he was studying. He was on a student grant, whilst taking an A'Level course at college and managed his finances without any help. Since the age of 12 he had travelled on public transport on his own. In his spare time he had a wide range of interests including building model boats and houses that had working details such as lights. He also liked painting and drawing, cycling, watching films, reading chemistry textbooks and going to museums and discos. His drawing ability was unusually good with excellent use of perspective, and he was also able to draw the tube map from memory. He sometimes tried to strike up conversations with people but he would tend to talk about things he was interested in rather than taking the other person's interests into account. He had one particular friend, that he had known since early schooldays when they had both been at the same school for autistic disorders (Subject A18). They met up every few weeks and went out together to cinemas, discos and restaurants. His mother said that the relationship was 'rather serious and stilted', and they did not discuss their feelings with one another, or joke very much. He had also recently got in touch with another old friend from the same school and at the time he was interviewed was planning to visit him in Belgium, where he lived (see Subject A13 for outcome of visit). At times he expressed feelings of loneliness and said he would like more friends. Nonetheless he was happy not to see the one friend he did have any more frequently. He mainly preferred slapstick comedy although he also found the more unpleasant parts of horror films funny. In recent years he had become less socially disinhibited and although he was still somewhat socially naive this was no longer to the extent of causing embarrassment. He was still inclined to lose his temper but always took this out on objects rather than people, and once threw his Walkman over a bridge in a temper. The early part of his education was spent in a specialist school for autism and after that went to a variety of different schools, both ordinary and for maladjusted children. After leaving school with several O'Levels he attended various evening courses and was now studying A'Level Chemistry. Ideally his ambition would be to do a degree in chemistry but he accepted this would not be possible without English O'level which he had been unable to pass, despite several attempts, and he was aiming at becoming

a laboratory technician. His language was fairly mature and he could understand complex instructions, for example. He often talked to himself in public and had difficulty following written plots. He could follow the action in a film, but would find it hard to understand the parts relating to feelings and relationships. Sometimes he would chat quite well, but the conversation would tend to be rather stilted. He had a good degree of insight into his problems and knew he was not socially competent. It worried him a great deal that he did not have a girlfriend like his brothers. He expressed sexual interest, but mainly by being interested in the types of tights and shoes that women were wearing. About 4 years earlier he had dressed in stockings and women's clothes and walked up and down in the house. His mother described 'talking about girls and the sexual activities of his siblings' as a preoccupation, as were horror films. He had a compulsion to write a very detailed entry in his diary every day and at the weekend he always did the same things at the same time. If he were prevented from doing this, or from writing his diary he would become very depressed. He was aged 21 years.

When first seen Subject A16 was aged 6 years 8 months. His expressive language was at the 3 year 7 month level and his comprehension was 3 years 10 months. He showed a number of abnormal language features including metaphorical language, pronoun reversal, stereotyped utterances and neologisms. His social functioning was markedly abnormal; he was slow to adapt to new situations and he had some attachments to odd objects. He also had some quasi-obsessive activities, rituals and marked stereotyped mannerisms. When followed-up he was aged 22 years and lived with his parents in a very remote village in the North of Scotland. He was able to carry out routine self-care without being reminded but could not recognise when he needed a haircut, for example. Although he could answer the telephone he did not ever make calls himself, and he managed his pocket money but did not take any greater financial responsibility. Life where he lived was very quiet and there was no public transport so there was very little opportunity for him to go anywhere alone. He did not work or attend any sort of day centre and tended to stay in his room for hours, having few interests apart from occasional television and playing his tapes. At times he could be quite

inquisitive and whilst his parents were being interviewed he came downstairs to listen to what was being said. In most situations, however, he would be very unlikely to join in any game or activity with others. He was very interested in collecting all sorts of things, including sea-shells, tapes and packs of playing cards, and he was also very good at doing jigsaw puzzles and was as likely to do them upside down as the right way up. Socially, he was very limited, having no friends and lacking any ability or desire to make acquaintances. Very occasionally if his mother was feeling sad he would give her a very quick hug and walk away, but his ability to show emotional reciprocity was rather inconsistent and he would be as likely to smile as to show sympathy. He was occasionally socially naive now, but was less disinhibited than in the past when he would smell people or ask what colour underwear they were wearing. His education took place in a boarding school which was run by a religious order, and catered for a variety of learning disorders. Since leaving school he had been at home. His mother reported that he spoke as little as possible and most of his utterances were 3-6 words in length, although he was capable of saying more. His grammar was immature. Beyond occasional pointing he made little use of gesture, but he did make reasonably good eye contact. He could understand and carry out simple instructions but had very little spontaneous speech. His voice showed little emotional range and his speech sounded 'mechanical'. He was aware that he was different but had little understanding beyond this, often saying 'I can't, I'm not able, maybe when I'm older'. Although he had shown some interest in several of his brother's girlfriends and would go and sit next to them, there was no attempt to touch them and he had not ever expressed any other sexual interest. He much preferred routine and was very orderly, keeping his room very tidy, but this was not compulsive in quality. In the previous 18 months he had become disturbed and his behaviour had worsened, so that he was now overactive and had frequent hand mannerisms. He was seen by a local psychiatrist and prescribed Melleril.

Subject A17 was aged 8 years 4 months when first seen. His expressive language was assessed at 5 years 7 months and his comprehension as 4 years 2 months. A lot of his speech consisted of stereotyped utterances and echolalia and he also showed evidence of

pronoun reversal and neologisms as well as having odd intonation. Socially his functioning was very limited and he had a number of quasi-obsessive behaviours, rituals and stereotyped mannerisms. He attended a specialist school for children with autistic disorders, and after leaving moved into a small community home for relatively able adults with autism. This was where he was living when he was followed-up at the age of 25 years. He could take care of his personal needs independently and although he might need a reminder to get his hair cut he could then go into town and get this done. His personal allowance was very small, but he was able to budget this so that he had enough for Christmas shopping etc. He could travel independently on public transport and was able to cope if there were unexpected cancellations or other changes of plan. During the day he attended a workshop for adults with autism. In his leisure time he showed some variety and initiative in his activities, but this was still somewhat limited. He was very keen on keeping fit and had run swum long distances in several charity events. Consequently, he spent quite a lot of time training for these. He also kept lists of the Top 20 pop charts on his computer and was rather preoccupied with his record collection. Visuo-spatially, he was very able and his parents reported that in arcades he always got the highest scores at any computer game. He also had a very good memory for details, such as dates, and his parents described him as 'more precise than the average person'. His ability to make acquaintances was limited and he had no real friends, although he did join with the other residents in his flat for social activities. He was aware that his social life was more limited than that of his brothers, but had very little interest in forming relationships. His appreciation of humour was mainly for things that other people would not find funny. When talking, he avoided eye contact. As far as his language was concerned, he could follow everyday instructions but had only limited understanding of plots on television or in films. He often read articles about swimming, in magazines and seemed to understand most of what he read. He could also write a letter, which although not complex in structure was mainly grammatical and had few spelling mistakes. It was possible to have a conversation with him but this was of limited flexibility. He preferred things to stay the same but could cope if they did change.

When first seen Subject A18 was aged 5 years 7 months. His expressive language was assessed as being equivalent to 3 years 4 months and his comprehension as 3 years 6 months. His speech frequently contained echolalic and stereotyped utterances and he had occasional neologisms and inappropriate remarks. His social development was very limited and he was slow to adapt to new situations. He had some quasi-obsessive activities and a few stereotyped hand and finger mannerisms. At the time of follow-up he was living independently away from home whilst studying for a university degree. He was able to take care of himself, drive a car, manage his finances and carry out domestic tasks without any assistance. He had a range of leisure activities including going for cycle rides and visits to the cinema. His visuo-spatial abilities were very well-developed and he liked to take clocks to pieces and re-assemble the intricate parts. He put this skill to practical use in mending clocks. He was skilled musically and played the cello to a high standard. His memory for details was also exceptionally good. He was able to strike up acquaintances, but there was nonetheless a slightly awkward quality about his attempts to do so. He had several friends, made either through university or from schooldays, and they shared a variety of interests and activities together. Whilst these relationships involved some shared enjoyment and selectivity they did not appear to exchange confidences or intimacies and there was a rather serious quality about them. Loneliness did not appear to be a problem for him. He was mostly even-tempered but if someone was annoyed with him he tended to be slightly slow in picking up the cues. Apart from a few years spent in a school for autistic disorders the majority of his education took place in normal schools and he left with the necessary qualifications to enter university. He was able to carry out a normal conversation and to report on events that happened without the need for probes or prompts. His speech sounded normal and he was able to read and write to the level required in his studies. At the time of follow-up he had failed his second-year exams and was having to resit them. He managed to pass them on the second attempt and later contact with him revealed that he had gone on to complete his degree successfully. He did not have detailed plans for the future but those he had were appropriate in their general direction. Although he had shown some interest in girls

and expressed an interest in marrying one day he had never had a girlfriend. He was aged 21 years.

Subject A19 was seen initially at the age of 6 years 7 months. His expressive language was above the ceiling of 6 years on the RDLS and his comprehension was 4 years 8 months. The main abnormal language feature that he showed was frequent use of neologisms. Socially, he was rather limited and would not participate in any group activities. He also had some ritualistic behaviours and stereotyped mannerisms. When he was 9 he emigrated to New Zealand with his family. At the time of the adult follow-up he was a post-graduate student, aged 23 years, and was living in a hall of residence where he was totally independent and looked after himself. He had a full driving licence and managed his income well. Much of his time was taken up with work, but he had a wide range of interests including listening to music, reading and going to cinemas and pubs. He had a very good sense of fun and an exceptionally good memory for dates and facts and this had assisted him in his studies. He seemed able to make acquaintances and friends fairly easily and often brought them to his parent's home. Some of them were made at university and some dated from schooldays. They shared activities and a sense of humour, but would tend to talk about factual things rather than feelings, and his parents said they all appeared rather 'restrained' in their interactions. They also said they doubted that he would confide in his friends although they clearly enjoyed one another's company. Although he could cope well with social situations he was also very happy in his own company and did not ever appear to be lonely. His sisters sometimes accused him of callousness because he tended not to respond to things in an emotional way, and because his range of facial expression was rather limited. His parents said, however, that he would notice if they were miserable and would try to comfort them. He was not socially disinhibited at all, although he did at times tend to monopolise the conversation somewhat with topics that were of interest to him.. Throughout his school career he had attended normal schools and he had boarded from the age of 9. His parents had worried about whether he would be able to cope, but he wanted to be the same as his brothers and asked to go. The school were aware of his difficulties and at times

he found it hard, but he coped without anything other than sensitive help from the staff. After leaving school he went to university and did a BSc. in Biochemistry. He was currently working part-time on his MSc. whilst employed as a laboratory assistant. Once he had completed this he was aiming to do a PhD. His speech was more or less normal, although perhaps a little formal, and he occasionally used words slightly out of context or with a slightly odd use of a catch phrase. He could carry out a conversation, and talked a lot, but this tended to be factual rather than social chit-chat, and his speech was rather slow. He hadn't shown any interest in girls at all and did not show very much interest in the idea of ever getting married. He tended to focus on the practical difficulties and hard work involved in raising a family, rather than on any of the positive or romantic aspects. He no longer had any compulsions or ritualistic behaviours, but very occasionally if he was excited he would flap his arms, and had learned to control this by folding them. His gait was also very slightly odd. He knew he had experienced problems in the past but now thought of himself as quite normal, and given the fact that his problems were fairly minor this was probably realistic.

The Developmental Language Disorder Group

At the time of the first comparison Subject DLD1 was aged 8 years 9 months. His expressive language was 2 years 10 months and his comprehension was 4 years 11 months. Much of his speech was echolalic and he had frequent neologisms. His social functioning was within normal limits but he had some quasi-obsessive activities, attachments to odd objects and a few stereotyped hand and finger mannerisms. At the time of follow-up he was living at home with his mother. He was aged 24 years and his general functioning was in the mildly learning-disabled range. He was able to carry out self-care on his own, but needed guidance in activities such as choosing new clothes. He could help with household chores and could prepare a simple meal. He could also cope with travel on public transport, providing it was local and routine and did not involve any changes. In his spare time he occupied himself

reasonably well, but had a rather limited range of activities and spent a lot of time in his room listening to records, or out in the town watching traffic. He attended a language unit in a local school for several years, and then transferred to a school for children with mild learning disorders. Since leaving school he had attended a local Social Education Centre. His use of language was largely correct, although his speech tended to be fairly simple without complex clauses. He could understand two-step instructions and follow the plot of television programmes providing they were fairly simple. Although he sometimes looked at books he really only paid attention to the pictures, and he could write only very simple letters.. He could converse in a limited way and could also give an account of something although the listener would need to ask questions to fill in the gaps he left. His mother described him as 'rather a loner without any close friends'. Occasionally he would meet up in town with one or two girls from the centre but these were not especially close relationships. One had, in the past, tried to dominate him and he had become quite depressed and not wanted to go to the centre. This was resolved when his mother had a word with the staff. On another occasion he had bought a girl an engagement ring, because he thought this was 'the thing to do' and his mother had taken it back to the shop. He was unusually routinized in his activities, so that for example he had always got ready for bed early in the evening and still continued to do so. This was not compulsive in quality, however. There were no other language problems evident in the family except that his brother had been in a remedial reading class for a few years.

In the initial study Subject DLD2 was aged 8 years 3 months. His expressive language was at the 4 year 7 month level and his comprehension was 5 years 10 months. Apart from pronoun reversal he had no abnormal language features; his social functioning was within normal limits and he had no quasi-obsessive or ritualistic behaviours. At follow-up he was living at home with his parents and although he talked about living independently his parents felt he would not really be able to cope. Although he could take care of his personal needs and could prepare a simple meal he was not able to take complete responsibility for carrying out domestic tasks, or in coping with unexpected events. Recently, he had passed his

driving test but had not ever driven without supervision. He managed his own rather simple finances himself and could make major purchases on his own. His grammar was reasonably correct although not very complex and his eye-contact was good. At times it was necessary to listen quite hard to what he was saying because he had quite poor articulation. He seemed to understand the plots of television programmes provided they were not too complex, and his mother described him as a 'soap addict'. He could give full and graphic reports of events if necessary and could hold a conversation quite well. His range of interests was somewhat limited, however. He was currently unemployed and spent a lot of time walking around the town observing what was happening. His ambition was to take on an ice-cream round and he spent hours working out the route and practising sums so that he would be proficient at giving change. He also spent a lot of time studying bus timetables. Until the age of 11 he had attended a language unit and after that a school for mild learning disorders. The longest period of employment he had ever had was one year and he had been in several jobs on building sites or in factories. The reasons he gave for leaving were:- 'poor pay'; 'didn't get on with the manager', and 'because the factory closed down'. He had an extensive range of acquaintances amongst local shopkeepers and people that he met at bus-stops and in parks and he had several old friends from school, that he had brought home a few times. They would go out together sometimes to the pub, or to a burger bar, and although they seemed to share jokes, his mother did not feel that they confided in each other or that they really cared very much about one another. He enjoyed his own company and did not seem to want more friends. Although he had a sense of humour, this was somewhat immature and he was very keen on practical jokes, e.g. offering to make you a cup of tea and then giving you an empty cup. He had not shown any sexual interest and had never had a girlfriend. His mother was concerned that he might not be able to manage an ice-cream round as he had never driven a van, nor had he ever had to manage large amounts of cash, but she was prepared to let him try as he was very keen to do so. He was aged 24 years.

Subject DLD3 was excluded from the follow-up because of his hearing impairment. A summary of his functioning is given in Appendix II.

Subject DLD4 was aged 9 years 4 months when first seen. His expressive language was above the ceiling of 6 years on the RDLS and his comprehension was at the 6 year level. His speech was occasionally echolalic and he occasionally used neologisms. Apart from these features there were no other linguistic abnormalities; his social functioning was within normal limits and he had no quasi-obsessive or ritualistic behaviours. When followed-up he was aged 26 years. He was married and living with his wife, and her child from a previous relationship, in one-roomed accommodation provided by the council whilst he waited for a council flat to become available. At the time of the interview they were expecting another child. He had no problems looking after himself in any way and he had a full driving licence. Financially, he managed reasonably well, although his mother said that he 'gets his pay packet on Friday and he's broke by Saturday'. He was not different from his brothers in this respect however. In his leisure time he took part in a range of activities including going to the cinema, making models with match sticks and watching TV. His main companions were his brothers and his mother reported that outside of the family he found it quite difficult to make acquaintances of his own age, and was more at ease in older company. In a group he would tend to sit quietly and would only join in occasionally, but he apparently got on reasonably well with his work mates. The early part of his education was spent at a boarding school for language disorders, and after that he returned home and attended a normal secondary school. He had a large number of jobs, mainly as a storeman or security guard, and gave reasons for leaving such as ' wanted more money', 'didn't get on with the manager', 'got drunk', and his mother said that he was not a very reliable timekeeper. Before getting married he had a number of girlfriends and now appeared to have a close reciprocal relationship with his wife. For everyday situations his language was adequate and he was able to understand most television plots, join in conversations, give reports, read a newspaper and write a simple letter. He tended to 'live from day to day', however, according to his mother and his plans for the future were rather vague. His father appeared to have had language problems with many semantic errors and he was still illiterate..

Subject DLD5 was excluded from the follow-up because of his hearing impairment. A summary of his functioning is given in Appendix .II.

Subject DLD6 was aged 10 years when first assessed and both his expressive language and comprehension were above the 6-year ceiling on the RDLS. He often used neologisms in his speech but apart from these he showed no other abnormal language features; his social functioning was within normal limits and he had no ritualistic or quasi-obsessive behaviours. When followed-up into adulthood he was living independently in a flat. He had originally moved away from home to live with his girlfriend, but they had split up and he continued living there on his own. He cared for himself entirely independently and managed his own finances sensibly. His range of interests was very limited and mainly revolved around pigeons, which he bred and raced. Every evening he would take the pigeons training and he often went to pigeon-racing meetings. His parents described him as a loner. He would speak to others if they spoke first but was unlikely to initiate contact. Despite meeting people through pigeon-racing he did not appear to have any close confiding relationships. His mother felt that he preferred his own company and was not really lonely despite his lack of friends. Between the ages of 7 and 9 he boarded at a school for children with language disorders, but after that he returned home and was at normal schools where he did not get any further speech therapy. For 10 years he had been in his present job which involved maintaining drains and sewers. His speech now sounded fairly normal and although he would occasionally chat freely it was rare for him to have a real conversation. He did read, but this was nearly always magazines about pigeons. The relationship with his girlfriend had lasted for 5 years and during that time they lived together and had a child. His interest in pigeons preoccupied him to such an extent that he didn't really join in much with anything else, and this probably contributed to the break-up of the relationship. They appeared to enjoy each other's company but also lacked the ability to confide in one another, both being inclined to 'bottle up' their feelings rather than expressing them. At the time of follow-up he was aged 28 years.

Subject DLD7 was aged 7 years 9 months in the first comparison. His expressive language was at the 5 year 3 month level and his comprehension was equivalent to a level of 5 years. His intonation was slightly flat, but otherwise his language had no abnormal features. Socially, he was functioning within normal limits and he had no quasi-obsessive or ritualistic behaviours. When seen in adulthood he was living at home with his parents. He had no desire to leave and recognised he would find it difficult to take the responsibility necessary to manage on his own. In all aspects of self-care he was independent and he could carry out most household chores as well as using a telephone competently. He did not drive and his parents had not encouraged him to learn as they felt that although he might pass the test he would not be able to cope with the demands of driving independently. His main interests were model-making, watching television, doing jigsaws and listening to records. He also belonged to the Boys Brigade, went cycling and regularly went to rock concerts. Although he joined in with groups to go to concerts by bus, his parents said that he was very solitary and on these occasions was merely one among strangers. He had no friends and although he had sometimes arranged to meet work mates in town they had not ever turned up. His mother felt that he must be lonely but had no evidence of this as he had never expressed a desire for more social contact. He would join in with family activities, such as putting up decorations at Christmas, but did not fully 'enter into the spirit' of the occasion, only showing a limited amount of pleasure. His mother said, however, that he could respond sympathetically if someone was not happy, and tended to be more thoughtful in this respect than his brothers and sisters, who had not had any developmental problems. His sense of humour was appropriate for his age and he was not socially disinhibited, although at times he could be very blunt. He boarded at a school for language disorders for several years, and when he returned home he attended normal schools. A family friend found him a job at a factory but he only stayed one morning as he 'didn't know anyone'. His current job as a machine operator was obtained through family contacts and the factory were aware when they employed him that his concentration span was limited. His mother said that, in effect, it was a form of sheltered job. After being there for a few months he set fire to some paper in one of the outbuildings and was sacked. When his father promised that this would not

happen again he was re-employed and there had been no further problems since. His ability to give an account of activities and events, or to converse were somewhat limited and probes were needed to sustain any interaction. Nor did he have very much tonal expressiveness in his voice. He could carry out 2-3 part instructions, however, and his use of language was reasonably accurate. He did not make any plans for the future and had never shown any interest in girls. When followed-up he was aged 24 years.

In the initial study Subject DLD8 was aged 6 years 10 months. His expressive language was 3 years 2 months and his comprehension was at the 4 year level. His intonation was rather odd and he made frequent use of neologisms. He had some friends but would be unwilling to join in group activities and the his peer relationships were reported to be abnormal. He had no quasi-obsessive or ritualistic behaviours. In adulthood he was living at home with his father and stepmother. In all aspects of self-care he was entirely independent and he could use a telephone and manage his finances himself. Most of his spare time was spent pursuing his preoccupation with buses and his less intense interest in CB radio. He spent a lot of time hanging around bus stations, going on bus journeys when he could afford it and looking at bus magazines. His social overtures were somewhat limited and he would speak if spoken to but would not make the first move. There were two friends that he visited regularly, one shared his interest in buses, the other was interested in CB radio. These relationships were clearly selective, did involve some apparent pleasure in each others company, and some sharing of confidences, but there was still nonetheless a slightly odd quality to them because of their restricted range of interests. He did not appear to be lonely. Until the age of 11 he boarded, first at a school for children with language disorders and then at one for children with multiple handicaps. When he returned home he attended a normal comprehensive school where he was in the remedial stream. After school he had several jobs from which he was made redundant through closures, but in another one he was sacked for being too slow. The majority of the time since leaving school he had been unemployed. He was keen to get a job, however, and the previous year had, on his own initiative, written a letter describing his interest in buses and had photocopied it and sent it to all the bus stations

in Britain asking if they would give him a job. His eye contact was variable and his spontaneous speech was limited in quantity and flexibility. He could understand and carry out 2-3 part instructions and could follow the plot of a television programme provided it did not get too complicated. Quite often he would look at a newspaper but his father thought he would mainly read the very short stories and he was not interested in the more serious topics such as politics. He had never had a girlfriend and did not show very much interest in having one although his father said that he did look at pornographic magazines. He was aged 22 years.

Subject DLD9 was aged 9 years when first seen and his expressive language was at the level of 5 years 3 months. His comprehension was above the ceiling of 6 years on the RDLS. His intonation was rather flat and he occasionally produced neologisms. He would be unwilling to participate in group activities and would rarely approach other children. The quality of his peer relationships was said to be slightly abnormal. He showed some evidence of ritualistic behaviour and marked quasi-obsessive activities and attachments to odd objects. When followed-up he was aged 25 years and was living independently in a flat belonging to an organisation that specialised in providing accommodation for disabled people. It had been his idea to move away from home, and although his parents had helped him approach the charity he had played a major part in making the necessary decisions. He looked after himself entirely independently and did all his own shopping, cooking and household chores. In addition, he managed his own finances and was meticulously careful with his money. He was also able to travel independently on public transport to places some distance away. He was able to cope with most things provided he had come across them before but had difficulty with the unexpected, e.g. his cooker started to smoke and he didn't know what to do. Although he had a very well-organised daily routine and did not like making changes to this, he would if it became necessary. He hated being in a situation where he felt rushed, and he had to be allowed do things at his own rather slow pace. In addition to his developmental problems he had very poor eyesight and this, in combination with his slowness meant that he could not cope with the demands of a full-time job. He did voluntary

work cleaning a local monument twice a week, but other than this filled his time with doing his domestic chores, weight-training at a local health club and looking after his extensive collection of model cars. He was very interested in this collection, but not really preoccupied. Another favourite pastime was just walking around the town and watching people, e.g. workmen painting lines in the road. He was at a boarding school for language disorders for several years and then transferred to a school that catered for children with a very mixed range of disorders. His speech was now fairly well developed and his grammar was largely correct with occasional errors (e.g. irregular plurals). He could follow a fairly simple plot but would get lost if the story became too complex. If he gave an account of events he would pay attention to minute detail, and he could converse well although he would tend to talk about things he was interested in. He had some articulation difficulties that made it hard at times to understand what he was saying. At present, he was reading the Bible at bedtime. His father said that he understood very little of it but kept persisting hoping it would eventually make sense. He enjoyed company but could not cope with being around other people for very long. Even when his parents came to visit him he would tell them when he wanted them to go and would make it plain they were not welcome if they arrived early. He could make acquaintances but sometimes started conversations in slightly inappropriate ways e.g. by talking about the Guinness Book of Records and saying 'Did you know that....?'. He did not appear to want any close friends although he met up with the curate at his church every couple of weeks for a chat and a meal, and seemed to enjoy his company. Although he had a strong sense of fun his sense of humour was rather immature e.g. simple puns, and he would not understand the more subtle types of humour. He showed some understanding of how other people were feeling and his mother said he would show appropriate concern if someone was not feeling happy. Girls were of absolutely no interest to him. He could only see the difficulties involved rather than any of the positive emotional aspects and said 'girls are just trouble'.

Subject DLD10 was aged 8 years 5 months when first seen. He frequently produced neologisms but otherwise did not show any particularly deviant language features. His

expressive language was above the 6 year ceiling on the RDLS and his comprehension was 5 years 11 months. He would make approaches to other children and had some friends but his peer relationships were nonetheless said to be slightly abnormal in quality and he had a lot of quasi-obsessive activities and rituals. When followed-up into adulthood he was living in his own room in a shared house. This belonged to a charity that provided accommodation for people who were socially inadequate. A housekeeper cooked most of the meals, although he could if necessary look after himself. He was basically in charge of his own finances, but his brother provided some supervision as he had a tendency to lend quite large amounts of money too readily. He acted as the informant for the follow-up interview and described him as 'very gullible'. He desperately wanted to have friends, and tried to 'buy' people by paying when they went out together and lending them money. He tended to think of them as friends until they let him down in some way, e.g. not paying back loans or using his phone, so that on one occasion he had a large phone bill. His brother thought that he took pleasure in their company but that this was probably not reciprocated very much. He often tried to strike up an acquaintance with someone in ways that were inappropriate, e.g. starting a conversation by saying 'do you think I'm handsome?'. In his speech there were frequent semantic errors, e.g. 'I get the *expression*' for 'impression' and syntactic errors e.g. 'I saw a mice', and his utterances tended to be very long with lots of conjunctions. He sometimes flicked through a magazine, but seemed to have little understanding of the content, and he could only write very simple letters. If he gave a report of something that had happened it would usually contain a lot of irrelevant detail. It seemed to be difficult for him to think of the consequences of his actions, or to know what was the right thing to do in a situation. He had recently joined a course of philosophy evening classes and although he understood very little of what was being discussed he did not feel he could stop going in case he offended the tutor. His interests were rather limited and he spent a lot of his spare time programming and watching his video, and going to discos. He appreciated humour but this tended to be mainly slapstick or rather immature. His brother found him embarrassing at times and he sometimes said things that were inappropriate, e.g. in one of the places he lived as a lodger he was asked to leave because he had asked a teenage baby-sitter about

sex and offered her a drink. He found it hard to understand that this had frightened her as he thought this was the 'right way to chat a girl up'. He had never had a girlfriend although he seemed to be attracted to women. He attended a boarding school for children with general learning difficulties and on leaving he started a catering apprenticeship in a restaurant but was sacked when he had a schizophreniform breakdown and was having visual and auditory hallucinations and believing he was Jesus (see chapter 13 for details). He had only had brief jobs, and was mainly unemployed. As a child his brother described his preoccupations as so intrusive that they threatened to destroy family life, e.g. winding up clocks so that they all chimed at the same time. In adulthood he was somewhat preoccupied with his video but this was no longer an intrusive interest. He was very compulsive until the age of 18, but although unusually routinized in adulthood he was no longer compulsive. He had little insight into the nature of his problems and said 'I'm the odd one out in the family, I don't take exams'. The main concerns his brother had were that he was lonely and that he was often taken advantage of. He was 25 years when he was followed-up.

Subject DLD11 was aged 7 years 9 months when first seen. Both his expressive language and his comprehension were above the 6 year level on the RDLS. He frequently produced neologisms but otherwise had no deviant language features; socially he was functioning within normal limits and his only relevant behavioural problem was a marked resistance to change. When contacted in adulthood he was initially unwilling to take part in the research. This seemed to be partly due to shyness, and partly because he felt he had 'put his problems behind him'. He eventually agreed, however, and was very co-operative. At the time of follow-up he was aged 24 years and was living at home with his parents. Although he did not help much with the household chores, he was probably capable of doing so if necessary. Since leaving school he had worked as a stock control clerk in a factory, and he took complete responsibility for managing his own finances. He had his own car and often drove long distances to attend rugby matches. Apart from watching rugby his interests were varied and he liked to watch television, and play card games, squash and snooker. Although he met up with several acquaintances from work to play these sports he did not have any close

confiding relationships. In any social gathering he would tend to be on the outside rather than joining in, and he found it very difficult to cope with talking to more than one person at a time. He had never shown any interest in having a girlfriend and apparently enjoyed being on his own, with no apparent expressions of loneliness. His mother reported that it was often necessary to ask him questions to clarify what he had said as he tended to make semantic and syntactic errors. Although he did at times chat freely most conversations with him required the other participant to work quite hard to keep it going. He could write simple messages but if he needed to write any sort of letter his mother would write it for him and he would then copy it. He rarely read anything apart from the sports pages of the newspaper and his mother was unsure how much of this he understood. For several years he had boarded at a school for children with language disorders and then returned home to attend a language unit. Later he went to a normal comprehensive, and left without any formal qualifications. He occasionally talked about trying to find a new job, but was not very realistic about the sort of job he would be likely to get. .He had seen an advert for a post as an illustrator, for example, and even though he had no training, and no talent for drawing, he still felt it might be worth applying for.

When seen in the initial study Subject DLD12 was aged 7 years 8 months. His expressive language was at the 4 year 6 month level and his comprehension was equivalent to 4 years 11 months. His only deviant language feature was an odd intonation pattern but socially he was markedly abnormal with few friends and very limited joining in of group activities. He had marked attachments to odd objects; definite quasi-obsessive activities and some evidence of hand and finger stereotypies. At the time of the adult follow-up he was living with his mother and brother in socially difficult circumstances. He was entirely independent in looking after himself and was working as a security guard. This job was his first and he had only been in it for 5 months, having been unemployed until then. He managed his own finances and was reliable; getting to work on time and remembering appointments. His grammar was immature and the complexity limited but he could understand reasonably simple plots and instructions. Although he could make appropriate responses in a

conversation he had little spontaneous chat and his voice was rather lacking in emotional expression. He liked looking at books about animals but appeared to look mainly at the pictures rather then reading the words and his written ability was very poor. In his spare time he had a limited range of interests including drawing, watching videos and listening to tapes. He did not make acquaintances easily and had no friends. Nonetheless, although he often complained of boredom he did not express any desire for more social contact. His sensitivity to other people's feelings was limited, and his mother said if she was unhappy he would take no notice and would carry on as normal. He was very easily annoyed and his family had to be very careful not to upset him. He appeared to have little insight into his difficulties and showed no interest in girls at all. At the time of follow-up he was aged 24 years.

Subject DLD13 was aged 5 years 10 months when first seen. His expressive language was at the 15- month level and his comprehension was equivalent to 4 years. His peer relationships were markedly abnormal and he rarely made approaches to other children. He showed some evidence of quasi-obsessive interests and some stereotyped mannerisms. In the adult follow-up he was living at home with his mother and was aged 21 years. He could look after himself competently, manage his own finances independently and was able to make major purchases without help. He had a full driving licence and ran a mobile disco in his spare time. Apart from this he had a fairly limited range of interests but did sometimes go to a local youth club or to a roller-skating rink. He was able to join in conversations reasonably well and he could understand most everyday linguistic situations. At times it could be difficult to understand what he was saying as he had a few articulatory difficulties. He would only write very simple phrases and would not be able to read and understand the content of newspaper stories. His mother reported that he seemed to get on well with his work mates and often made them laugh. His sense of humour was described as 'dry' and seemed to be appropriate for his age. Nonetheless, his mother did not think he had any close friends, although she said that he tended to be secretive and often went out on his own. When she asked him where he had been he always replied 'nowhere'. She also said that he did not appear to be lonely, and tended to prefer his own company. It was difficult to tell for

certain how he felt, however, as he was so 'deep'. He showed some interest in girls but had not had any girlfriends as far as his mother was aware. When he was interviewed he reported having had several girlfriends, but further questioning revealed that the longest relationship had lasted for only three weeks and they had been out together only a few times. He said that he 'did not believe in sex before marriage' and that he could not understand why anyone got married, they were 'making right fools of themselves'. His secondary education took place in a school for children with mild learning disorders and when he left he did a course in basic literacy and arithmetical skills. After this he went on several Youth Training Schemes, followed by 18 months out of work. He had been in his current job as a machine operator for 2 years. Although he had not had any particular problems in this job he was keen to do something different and had just applied for a cleaning job at a nearby airport. He did not recognise that he had any problems, either now or in the past, and simply said that he could be rather 'moody'.

In the first comparison Subject DLD14 was aged 9 years 1 month. His expressive language was at the 5 year level and his comprehension was 4 years 7 months. Socially, he was functioning within normal limits; he had no deviant language features and no quasi-obsessive or ritualistic behaviours. At the time of the adult follow-up he was aged 25 years and was living at home with his parents. Although he was entirely independent in all aspects of personal care and also managed his own finances competently his mother thought that he would have difficulty in coping with all the household chores and taking the responsibility needed to manage his own home. He recognised that he would find it difficult and was content to stay where he was for the foreseeable future. He was learning to drive but had failed his test twice. He had boarded at a school for children with language disorders for several years and after returning home he had attended a normal secondary school where he was put in a remedial stream. At this stage he was teased mercilessly and played truant to avoid it. For 6 months at the age of 13 he did not go to school at all and would hide in the local woods all day. He left school with no formal qualifications and went to a college for several years to learn basic skills such as English and mathematics. On leaving he got a job

on a building site but didn't like it. He was injured by some heavy equipment after only a few days and never returned after his sick leave. After this he had several long spells of unemployment interspersed with a few jobs, each lasting less than 1 year. In one job he was badly taunted and left because of this. At the time of the interview he had been unemployed for over 2 years. He had an ambition to work as a park warden but was unsure how to go about it and found it very difficult to fill in job application forms. A lot of his time was spent studying maps and planning trips to places he had no means at present to visit, e.g. New Zealand and Iceland, and his mother reported that he was often in a world of his own, daydreaming about travelling overseas. He had a very good memory for details such as train timetables, which he could commit to memory, and also an unusually good memory for places that he had visited. His sense of humour was rather immature. Syntactically and semantically his language was largely correct although there were occasional errors. He could understand and carry out 2-3 part instructions, but he sometimes had trouble following the plots on television. If required to give an account of something he could do so but would need a number of prompts to keep going. His mother reported that he could also take part in a conversation reasonably well but this might be reduced in amount and flexibility. His eye contact was rather variable and he often looked away when talking to someone, apparently because of his shyness. His voice was also very quiet. He could often read newspaper headlines but found it difficult to make sense of the story itself and if he needed to write a simple letter his mother would plan it out for him and he would copy it. In any sort of social situation he was extremely shy and he avoided social contact wherever possible. His mother could only remember him having one friend in the past, and this had been 3 years previously. Even this friendship had only entailed a few trips out together and one visit to the house, but he had no friends now. His mother did not feel that he was lonely, however, although he did express a wish to have a girlfriend, partly because he wanted to be like his brothers. In recent years he had developed crushes on several girls in the locality but did not know how to approach them. He recognised that he had problems in mixing with people and attributed this to his shyness. His mother reported that he often said 'people pick on me because I'm quiet'.

Subject DLD15 was excluded from the follow-up because of his hearing impairment. A summary of his functioning is given in Appendix II.

Some of the early data on Subject DLD16 is missing, but it is known that he was aged 7 years 10 months when first seen and that his expressive language was assessed as being at the 4 year 2 month level, whilst his comprehension was 3 years 6 months. When followed-up into adulthood he was living as a lodger in a family. He was given this accommodation by the local Social Services department after he had suffered several schizophreniform episodes (see chapter 13 for details), and the aim of the placement was to provide him with basic supervision in preparation for living totally independently. Before his breakdown he had worked in a supermarket collecting trolleys, but now attended a Social Education Centre during the day. He joined in with many of the activities that were organised, such as discos, but had no real friends that he confided in, or with whom he shared interests. He tended to prefer his own company and did not appear to be lonely. Nor did he show any interest in girls or express any other sexual interest. His interests were rather limited in range but he had a tape collection and liked listening to music. In addition to his mild mental handicap and developmental language disorder he had Moebius syndrome which is characterised by congenital facial diplegia, and is a condition that is thought to result from agenesis of the brainstem nuclei. He could understand 2-3 part instructions well but had limited understanding of plots, and both his reading and writing abilities were very limited. He could provide a report if probes were given to sustain it and could converse reasonably well although he would be inclined to talk about things he was interested in. In general he was not socially disinhibited, and had no compulsive behaviours or difficulty in adapting to new situations. He was aged 23 years.

Subject DLD17 was aged 9 years 5 months when first seen. His expressive language was at the 3 year 9 month level whilst his comprehension was equivalent to 4 years 3 months. He showed no deviant language features or odd behaviours and his social functioning was within

normal limits. At follow-up he was aged 26 years and living at home with his parents. He had expressed some interest in moving away but had been unemployed for several years before getting his current job and so could not afford it. He was able to care for himself independently and was competent at household chores and at preparing meals. Although he could use the telephone independently he tended to ask his mother to make calls for him as he lacked confidence. He did not drive but was able to manage his finances well, budgeting sensibly and saving for items that he wanted. On several occasions he had been on holiday abroad on his own and had made all the arrangements himself. His range of interests was rather narrow and mainly revolved around keeping fit. His mother said this was 'almost an obsession' and he regularly did weightlifting, jogged and had run a number of marathons. He also liked listening to music and going to football matches. In any sort of social situation he was very shy and would only make limited contact with other people. He had no close friends or anyone that he shared his interests with. Nonetheless he did not appear to be lonely. His sense of humour seemed normal for his age and he was not socially disinhibited.

After leaving school at 16 he spent several years working in a hotel learning to be a waiter. He left because he was required to do a lot of split shifts and after that joined a Youth Training Scheme as a labourer. After this ended he was unemployed for a few years until he got his current job as a kitchen porter in a hotel. His speech sounded quite normal now and his grammar was mainly correct. He tried hard to improve himself and would often look up words in the dictionary and practise changing his intonation, which tended to be slightly monotonous. He also read a newspaper daily in an effort to improve his general knowledge. His mother said that he could usually follow the plot of a television programme and would sometimes comment on it afterwards. He could also, when in the right mood, give a good spontaneous account of an event, and likewise could sustain a conversation, although he would not be described as a very chatty person. His plans for the future tended to be either non-existent or rather vague. He had a fairly realistic appreciation of the problems he had, in particular his shyness, and attributed them to his language difficulties. He had never had a girlfriend and because of his lack of confidence found it very difficult to contemplate ever asking a girl to dance or to go out with him.. Despite these difficulties he said that he would

like to get married one day and his mother felt he had a realistic appreciation of what this involved, both emotionally and practically.

In the initial comparison Subject DLD18 was aged 9 years 2 months with language ages of 4 years 4 months and 5 years 2 months for expression and comprehension respectively. His intonation was rather flat, but otherwise he had no deviant language features or odd behaviours, and his social functioning was fairly normal. At the time of the adult follow-up he was aged 26 years and living at home with his parents. Although his mother did most of the household chores he was capable of looking after himself and had no difficulties in managing his finances or in using the telephone, and had organised a holiday abroad independently. He had a full driving licence and a range of activities including listening to music, watching television, going to football matches and the pub, and playing pool. His mother reported that he was able to strike up acquaintances quite well, apparently got on well with people he met at work and had a good sense of humour. Nevertheless he had no particular friends. His mother thought he must be lonely although he had never expressed any feelings of loneliness or any desire for more social contact. He attended a normal school until he was a teenager when he was found to be making homosexual advances to other boys and was sent away to an assessment centre where he stayed until leaving school. After this he had several different jobs either as a gardener or a factory worker, but was made redundant several times due to cut-backs and closures. His speech now sounded fairly normal with only occasional grammatical errors. He was able to follow plots well, give a full report of events and could converse normally, although his voice was slightly lacking in emotional expressiveness. His written ability was less good and although he filled in job applications sometimes, his mother reported that these often had spelling errors. He did not read books, but looked at a newspaper every day and appeared to understand much of what he read. His mother was not sure whether he had ever had any sexual relationships and said he was so secretive that if he had he would be unlikely to discuss them with her.

Subject DLD19 was aged 6 years 3 months when first assessed. His expressive language was above the 6 year ceiling on the RDLS and his comprehension was at the 5 year 5 month level. He had occasional echolalic episodes but otherwise there were no obvious linguistic, social or behavioural abnormalities detected. At follow-up he was living at home with his parents but planning to move out and live with his girlfriend in the near future. Only a few weeks before he was followed-up he had told his parents that he and his girlfriend were expecting a baby and this had resulted in a lot of turbulence within the family. He had attended an ordinary school and on leaving had obtained a City and Guilds qualification in joinery. His current work was as a joiner on a building site. He had not had any problems at work and had been in employment for most of the time since leaving school. Most of his leisure time was spent with his girlfriend, and although his range of interests was not very wide he did have some friends that he would go out to the pub with, and play snooker with sometimes. These seemed to be fairly normal relationships and he liked being with other people. His parents said that he could at times be obstinate but he was not unduly bothered by changes of plan or routine. The main problem that had arisen in the past few years was his uncontrollable temper. These outbursts of anger always occurred within the context of the family and he had on several occasions attacked his father and threatened his mother. He was always very sorry afterwards but tended to blame it on external factors outside his control. This aggression was causing his parents great distress and as a result of the problem coming to light during the follow-up interview the family were referred to a local psychiatrist for family therapy. He had some feelings of inferiority and these seemed to be related to his brother who was slightly older than him, had always been academically successful and was now a doctor. His success in some ways highlighted the difficulties he had experienced. His language now sounded mostly normal and he could understand and follow plots quite normally. His reporting and conversation were both slightly limited, however, as he did not have a lot of spontaneous or social chat, and it required some effort to keep a conversation going to and fro. His sense of humour was also rather immature for his age. He was planning that he and his girlfriend would get married before the baby was

born and seemed to have a realistic concept of what was involved in this step, both practically and emotionally. He was aged 22 years.

Subject DLD20 was aged 6 years 3 months at the time of the first comparison. His expressive language was assessed as being at the 4 year 8 month level and his comprehension was 4 years 5 months. He was occasionally echolalic and his intonation was rather flat, but otherwise there were no obvious abnormalities in either his language, behaviour or social functioning. At follow-up he was living at home with his parents. He had been engaged for several years and was planning to get married and live independently, but the relationship had recently ended and so he had changed his plans. At the time of the follow-up he was aged 23 years and was entirely independent in all aspects of personal care, travel and managing his finances. He had a range of leisure interests including playing the guitar, singing, and going to the cinema, to discos and to judo classes. Making friends did not seem to be a problem, -he was gregarious, had a good sense of humour and was able to strike up acquaintances e.g. in pubs, quite easily. He had at least one 'mate' with whom he shared a number of interests, and in whom he confided. and also had several other friends that he would meet up with sometimes. His early education was in a normal primary school and at a later stage he transferred to a school for children with mild learning disorders. Since leaving school he had almost always been in employment but had changed his job very frequently. The work he had done included being a waiter and working on a building site, and each change of job seemed to have been either because they had come to a natural end or for positive reasons such as more money or to avoid shift work. His current job was in a small shop where he undertook a range of duties including stacking the shelves and manning the till. He had done this job on and off since schooldays and the owner was always willing to take him back again when he needed a job. His speech sounded very normal and he could chat freely and spontaneously and give a good report of events. He realised he had suffered from language difficulties in the past but now said he had 'left all that behind'. His writing was still poor, however, and although he could write a short letter it would be full of grammatical and spelling errors. He did not read very much but tried hard to improve his

general knowledge and would often look up things that he was unsure about in an encyclopaedia. The relationship with his fiancee had lasted for 2 years and seemed to have been close, caring and quite normal. The main thing that had marred it had been her jealousy, and she eventually left him for someone else. He was very upset by this and hoped to meet another girl and get married one day.

Subject DLD21 was aged 9 years 6 months when included in the first comparison. His expressive language was above the 6 year ceiling on the RDLS and his comprehension was at the 6 year level. He was occasionally echolalic, and his speech was at times stereotyped, but apart from these he showed no other deviant language features. His peer relationships were reported to be slightly abnormal, although he did make approaches to other children and would join in with group activities. He had no stereotyped, ritualistic or quasi-obsessive behaviours. At follow-up he was aged 25 years. He had spent some time living independently, but although he was able to look after himself personally, domestically and financially he had returned home after only a few weeks. Apparently he had found it difficult to get up for work on time and gave this as his reason. Since leaving school he had been in a variety of jobs including on farms, in factories and in a hotel. Several of these jobs were Youth Training Schemes and had come to a natural end. He had never been unemployed for any length of time and had always found work through his own initiative and without any help from his family. His current job was taxi-driving in a small town. Work was his main interest. Any other pastimes he had tended to be rather limited and short-lived. In recent years he had been interested in playing the electric organ, and also in growing plants, but neither hobby had lasted very long. He was able to get on with colleagues at work but did not really have any friends with whom he shared activities, or anyone in whom he confided. Nevertheless he did not seem to be lonely, or to want any more social contact. His conversation was rather limited, as was his ability to give a report. He could respond appropriately but the responses tended to be rather short with little elaboration, and although he smiled and was friendly he had little spontaneous 'chat'. His voice was rather quiet and he had some articulatory difficulties. He could write simple letters, if necessary, but these

would have many grammatical and spelling errors. It was rare for him to read a book or newspaper and his mother thought he would find it difficult to understand the content of most newspaper items. He had only had one sexual relationship. This had lasted for several months, and he had also taken a couple of other girls out. His main difficulty with these relationships was that the girls wanted to talk a lot and he did not want to.

Subject DLD22 was seen initially at the age of 7 years 9 months when his expressive language was above the 6 year ceiling on the RDLS and his comprehension was 5 years 2 months. He showed some quasi-obsessive activities, but apart from these there was no evidence of any deviance in his behaviour, nor in his language or social functioning. At follow-up he was living with his wife and two young children in a mobile home. He was totally able to look after himself and carry out household chores and he budgeted the family finances sensibly. His speech now sounded very normal except when he got excited and then he would stammer slightly. He was interested in a range of things including badminton, tennis, television and spiritualism, and he was treasurer of the local branch of Gamblers Anonymous. He had become involved in this organisation because both his father and father-in-law were gamblers. In the past his mother said he had plenty of friends and could 'mix with anyone', but since marrying and having children he tended to spend all his spare time with his family. He was very sensitive to other people's feelings and was not easily annoyed. He had always attended mainstream school, and after leaving he went into the navy but had to come out because of his short-sight. Next he worked as a chef but left because the pay was poor. He was currently working as a street cleaner. His perception of his earlier problems was that he had merely had a stammer which he said he had worked hard to control. His wife was his first girlfriend and they got married in their early twenties. They appeared to have a happy and confiding relationship and despite their lack of money and poor accommodation they were working hard to better their family life. At the time of follow-up he was aged 25 years.

Subject DLD23 was aged 9 years 3 months when first seen. His expressive language was above the 6 year ceiling on the RDLS and his comprehension was at the 6 year level. He was occasionally echolalic and had a few stereotyped hand and finger mannerisms, but his social functioning was within normal limits. When traced for the adult follow-up he was aged 26 years and declined to take part. He was married and had not ever told his wife about his earlier language difficulties. His mother agreed to be interviewed, however, and was a co-operative informant. In his early twenties he had left home to get married and was now living entirely independently. He hadn't ever learned to drive but was able to organise holidays and his own finances capably. According to his mother his language was now 'fine' and she said that he was able to give reports and take part in conversations quite normally. It seemed probable, however, based on her descriptions that the amount and flexibility of his conversation might be less than normal. She also reported that he read a newspaper every day and appeared to understand the stories, rather than just reading the headlines. In his spare time he went to football matches, worked in his garden or around the house, or went to the pub. He could get along with people that he already knew, but found it hard to strike up new acquaintances and in social gatherings he would tend to be on the outside. His mother reported that he went out to the pub, fished and played golf with various colleagues from work. He would probably 'bottle up' his problems rather than confide in his friends but otherwise the quality of the friendships seemed fairly normal with some shared enjoyment, selectivity and visiting one another's houses. He had two girlfriends before meeting his wife and although his mother said that they had a normal and close relationship, he had nonetheless clearly not wanted to share his earlier experiences with her. All his education took place in mainstream schools and after leaving he did a City and Guilds qualification in painting and decorating. His father helped him to get a job and he had been in the same one ever since. It was his ambition to have his own decorating business one day but he realised he needed money to be able to do this and was quite realistic about his aims.

Appendix VIII

For ease of access and to preserve confidentiality the results in this table and the two that follow are presented in chronological age order rather than in the order assigned in the vignettes.

Individual Psychometric Scores and Age Equivalents at Time 3

Sub No.	WAIS-R Verb IQ	WAIS-R Perf. IQ	Raven's 'IQ'	PPVT Std Score	Gray Oral Reading	Edinburgh Reading	Schonell Spelling
AUTISM							
a	81	86	103	78	>17y 0m	14y 9m	14y 1m
b	122	100	117	135	>17y 0m	>16y 0m	>15y 0m
c	54	57	-	<19	11y 2m	7y 7m	12y 3m
d	86	100	110	86	>17y 0m	14y 9m	14y 8m
e	-	-	-	<19	<6y 0m	<7y 0m	<5y 0m
f	51	68	85	<19	-	<7y 0m	5y 1m
g	77	98	102	43	8y 5m	10y 1m	9y 4m
h	59	58	67	35	6y 3m	<7y 0m	5y 1m
i	52	74	92	<19	<6y 0m	<7y 0m	<5y 0m
j	91	78	79	94	>17y 0m	14y 9m	14y 5m
k	121	94	113	141	>17y 0m	>16y 0m	14y 6m
l	75	96	110	45	8y 6m	9y 6m	8y 6m
m	57	87	78	<19	6y 8m	7y 3m	7y 5m
n	79	92	111	65	15y 5m	13y 8m	11y 6m
o	60	87	111	26	6y 10m	7y 7m	8y 7m
p	70	79	108	32	12y 8m	8y 7m	10y 11m
q	75	82	92	56	14y 6m	10y 6m	11y 9m
r	48	78	85	<19	7y 0m	<7y 0m	7y 8m
s	61	76	98	43	9y 3m	7y 8m	10y 1m
DLD							
A	71	75	65	56	6y 4m	7y 0m	6y 3m
B	88	89	106	87	>17y 0m	>16y 0m	12y 5m
C	70	74	79	82	10y 2m	9y 0m	10y 5m
D	57	57	61	<19	6y 8m	<7y 0m	6y 7m
E	73	80	79	76	10y 0m	11y 7m	11y 6m
F	67	62	96	30	14y 6m	8y 10m	10y 7m
G	74	78	71	87	9y 7m	10y 3m	8y 10m
H	81	78	99	76	11y 0m	12y 0m	10y 10m
I	67	88	103	63	6y 8m	7y 11m	7y 0m
J	67	64	66	52	6y 11m	7y 7m	5y 11m
K	81	77	99	44	8y 6m	10y 1m	10y 4m
L	88	73	84	80	15y 9m	12y 2m	10y 8m
M	78	99	102	56	14y 4m	12y 10m	9y 11m
N	74	91	81	75	14y 3m	15y 5m	9y 11m
O	79	77	99	75	7y 2m	8y 8m	8y 7m
P	78	88	78	70	6y 11m	9y 4m	8y 1m
Q	82	87	100	69	>17y 0m	15y 11m	8y 7m
R	-	-	-	-	-	-	-
S	81	77	92	60	>17y 0m	14y 2m	9y 11m
T	74	76	75	72	11y 6m	10y 9m	8y 5m

Appendix IX

Individual Psychometric Scores at Time 1

Sub No.	WISC Verb IQ	WISC Perf. IQ	Raven's 'IQ'	PPVT Std Score	Reynell Scores Exp. LA	Comp. LA
AUTISM						
a	84	110	181	57	44	47
b	72	117	150	63	40	42
c	-	85	97	55	31	36
d	-	89	-	61	36	36
e	-	70	-	-	6-	7-
f	-	91	-	14	14	30
g	-	104	-	34	18	32
h	-	82	120	50	43	46
i	-	107	-	-	14	7-
j	-	81	-	77	62	46
k	103	113	156	75	72+	56
l	67	93	95	56	67	64
m	48	94	117	40	38	38
n	57	80	67	65	67	50
o	-	94	132	51	33	37
p	55	92	97	28	59	51
q	61	89	103	68	72+	68
r	-	94	-	42	29	30
s	52	82	93	43	35	45
DLD						
A	-	89	94	67	15	48
B	87	97	100	89	72+	65
C	-	94	91	93	38	48
D	70	75	80	65	50	42
E	85	83	-	73	56	53
F	63	80	100	89	34	59
G	80	93	98	88	63	60
H	90	96	124	72	72+	72+
I	-	106	137	67	54	59
J	66	72	107	83	55	70
K	60	85	83	55	60	55
L	87	91	71	78	72+	62
M	72	103	131	69	72+	71
N	79	101	89	78	72+	72
O	77	86	128	75	63	72+
P	77	82	76	75	52	62
Q	86	97	94	75	72+	72
R	86	103	97	81	72+	72
S	79	89	119	81	45	51
T	82	83	90	77	72+	72+

Appendix X
Individual Psychometric Scores at Time 2

Sub No.	WISC Performance IQ	PPVT Std Score
AUTISM		
a	93	89
b	104	87
c	74	49
d	114	114
e	65	10
f	-	-
g	114	71
h	80	39
i	-	-
j	82	106
k	-	-
l	90	68
m	89	43
n	-	-
o	90	48
p	86	59
q	101	82
r	103	29
s	83	50
DLD		
A	83	76
B	107	100
C	89	74
D	-	-
E	-	-
F	69	68
G	89	98
H	-	-
I	107	70
J	76	90
K	80	59
L	-	-
M	115	58
N	96	70
O	-	-
P	-	-
Q	-	-
R	106	79
S	-	-
T	-	-

There are a number of blank scores in this table due to missing information at Time 2.

Appendix XI

Codings and Ranks used in Analyses in Chapter Six

The following information relates to the items listed in the tables in Chapter Six: Speech and Language. For each item the codings given in the informant report or observational assessment are given on the left-hand side. These codings were then given categorical labels (as shown in capitals on the right-hand side). For the purposes of the Mann-Whitney analysis these categories were ranked from highest to lowest in the order shown here.

(a) TABLE 6.2: GENERAL CHARACTERISTICS OF SPEECH AND LANGUAGE

Utterance Length
(i) Informant report

0= Predominant response usually 6 or more words	**GOOD**
1=Predominant response 3-6 words	**MARGINAL**
2=Predominant response 1-2 words	**POOR**
3= No speech	

Understanding Instructions
(i) Informant report

0= Able to follow and carry out complex 2-3 step instructions, or conditional	**GOOD**
1= Can understand simple instructions	**MARGINAL**
2= Can learn simple instructions only after frequent repetitions or when used in familiar context	**POOR**
3= Little or no apparent understanding	

Understanding Plots
(i) Informant report

0= Follows the plot from TV, comic strips, books	**GOOD**
1= Watches TV and looks at books but limited comprehension of plots/sequences	**MARGINAL**
2= Little understanding of plots, enjoys the action on TV only, e.g. shooting and/or looks at pictures in books but does not follow story	**POOR**
3= Little or no response to TV and/or little or no interest in books (other than flicking pages or other non-content related activity).	

Reporting
(i) Informant report
0= Gives a reasonable account of day's activities without specific probes, but may need to be asked, i.e. chats freely — GOOD

1= Gives an account but needs specific probes to sustain conversation. — MARGINAL

2=Information very restricted to specific probes only or difficult to elicit even if apparently lots of talk — POOR
3= Very little spontaneous speech

(ii) Observational information
Codes and ratings as for informant report

Conversational abilities
(i) Informant report
0=Has flow of conversation building on other person's dialogue — GOOD

1=Occasional conversation, but amount less than normal or limited flexibility. — MARGINAL

2=Little or no reciprocal conversation; follows own dialogue rather than an interchange. — POOR
3= Very little spontaneous speech.

(ii) Observational information
0= Has flow of conversation building on interviewer's dialogue. This rating requires that much of S's speech provides both a response to E's speech and a piece of talk, (though not necessarily a question) that builds on what has just been said and which allows a response from E. i.e. at least 3 element sequences. — GOOD

1= Some of S's speech involves 3 element sequences including either some spontaneous elaboration of own responses for E's benefit or giving leads for E to follow, but either this is less in amount than normal or it is limited in flexibility. — MARGINAL

2= Little or no reciprocal conversation; follows own monologue rather than an interchange;may have some spontaneous offering of information but little sense of reciprocity. — POOR
3= Very little spontaneous communicative speech, although there may be much echoed or non-communicative speech. Include S who makes some limited responses but very few.

(b) TABLE 6.3; INTELLIGIBILITY OF SPEECH

(i) Informant report
0=Understood by anybody: clear enunciation of most sounds. — GOOD

1=Understood better by family than others because of difficulty with some sounds. — MARGINAL

2= Definite articulation difficulties such that some words difficult to understand. — POOR
3= Strangers find speech almost impossible to understand.

(ii) Observational information

0= Clear enunciation of most sounds attempted; usually easy to understand.	**GOOD**
2= Speech often difficult to understand due to problems in pronunciation.	**POOR**

(c) TABLE 6.4: DEVIANT FEATURES OF SPEECH AND LANGUAGE

Echolalia

(i) Informant report

0= Rarely or never uses echolalia	**NO DEVIANCE**
1=Very occasional echolalia	**MARGINAL DEVIANCE**
2=Sometimes uses echolalic language 3= Speech almost exclusively echolalic utterances	**DEFINITE DEVIANCE**

(ii) Observational information

0= Rarely or never repeats interviewer's speech.	**NO DEVIANCE**
1= Occasional echoing of 1 or 2 words or phrases.	**MARGINAL DEVIANCE**
2= Echoing words and phrases regularly, but some productive language (can be stereotyped). 3= Speech largely consists of immediate echolalia.	**DEFINITE DEVIANCE**

Stereotyped Phrases

(i) Informant report

0= Rarely or never	**NO DEVIANCE**
1=Speech tends to be repetitive but not particularly stereotyped	**MARGINAL DEVIANCE**
2=Often uses stereotyped utterances 3= Speech almost exclusively stereotyped utterances	**DEFINITE DEVIANCE**

(ii) Observational information

0= Rarely or never uses stereotyped phrases	**NO DEVIANCE**
1= Majority of non echoed language is spontaneous, but some stereotyped phrases.	**MARGINAL DEVIANCE**
2= Stereotyped utterances account for majority of non-echoed language but some productive language as well. 3= Almost all speech consists of stereotyped phrases.	**DEFINITE DEVIANCE**

Neologisms/Metaphorical Language

(i) Informant report

0= Rare or occasional use of neologisms/metaphorical language in conjunction with normal language	**NO DEVIANCE**
1=Has a few neologisms that are used consistently or occasional use of metaphorical language	**MARGINAL DEVIANCE**
2= Frequent and persistent use of neologisms or predominant use of metaphorical ways of saying things.	**DEFINITE DEVIANCE**

(ii) Observational information

0= Uses appropriate words/phrases of direct relevance.	**NO DEVIANCE**
1= Words and phrases with minor variation from normal.	**MARGINAL DEVIANCE**
2= Obvious invented words or phrases (e.g. 'bossit' for teacher,'take-a-nap' for bed) or autistic-type metaphorical language (e.g. 'hot rain' for steam).	**DEFINITE DEVIANCE**

Pronoun Reversal

(i) Informant report

0= No confusion between 1st and 2nd/3rd person.	**NO DEVIANCE**
1= Refers to self by name instead of 'I' but no persistent 'you-I' confusion	**MARGINAL DEVIANCE**
2=Persistent 'you-I' confusion but 'you' not used with intonation of a question	**DEFINITE DEVIANCE**
3= Persistent 'you-I' confusion with intonation of a question when 'you' used for 'I'.	

(ii) Observational information

0= No confusion between 1st/2nd or 1st/3rd person.	**NO DEVIANCE**
1= Referred to self by name, 'he/she', or 'one' instead of 'I' but no obvious 'you-I' confusion.	**MARGINAL DEVIANCE**
2= Definite 'you-I' confusion, but 'you' not used with intonation of a question.	**DEFINITE DEVIANCE**
3= Obvious 'you-I' confusion with intonation of a question when using 'you' for 'I'.	

Inappropriate questions

(i) Informant report

0= Questions appropriate to conversation and setting.	**NO DEVIANCE**
1= Uses some questions/statements regardless of situation	**MARGINAL DEVIANCE**
2= Frequent use of inappropriate questions/statements	**DEFINITE DEVIANCE**

(ii) Observational information
(If content of questions or statements is highly inappropriate, no repetition is necessary).

0=Questions and statements appropriate to conversation and setting. **NO DEVIANCE**

1= Some questions or statements that are inappropriate because of amount of repetition. **MARGINAL DEVIANCE**

2= Questions or statements inappropriate because of content. **DEFINITE DEVIANCE**

Prosodic oddities
(i) Informant report
0= Normally and appropriately varying intonation, reasonable volume and normal rate of speech with regular rhythm co-ordinated with breathing. **NO DEVIANCE**

1= Little variation in pitch and tone; rather flat or exaggerated but not obviously peculiar intonation, or slightly unusual volume and/or speech that tends to be somewhat unusually slow or fast or jerky. **MARGINAL DEVIANCE**

2= Speech that is clearly abnormal in terms of being slow and halting and/or inappropriately rapid and/or jerky and irregular in rhythm (other than ordinary stutter/stammer) such that there is some inappropriate pitch and stress and/or markedly flat and toneless ('mechanical') speech and/or consistently abnormal volume. **DEFINITE DEVIANCE**

3= Speech that is frequently difficult to understand because of abnormalities of type specified under '2'.

(ii) Observational information
Codes and ratings as for informant report.

Reduced vocal expressiveness
(i) Informant report
0= Normal tonal expressiveness **NO DEVIANCE**

1= Tonal expressiveness limited in range. **MARGINAL DEVIANCE**

3= Almost no emotional expression in speech **DEFINITE DEVIANCE**

N.B. There is no '2' rating for this item

Appendix XII

Codings and Ranks used in Analyses in Chapter Seven

The following information relates to the section on Special Skills in Chapter Seven: Cognitive Functioning. The informant was asked whether the subject had any special skills in the areas of visuo-spatial ability; computational skills; music; memory and drawing. A coding was allocated to each of these areas from the list below., and when the Mann-Whitney analysis was carried out the ranks used were the same as the codings.

TABLE 7.4: SPECIAL SKILLS

0= No outstanding skills/knowledge in relation to overall level of ability whether high or low

1= Isolated skill/knowledge commented upon by others but not much above subjects own general level of functioning

2= Isolated skill/knowledge that is definitely out of keeping with subject's general level of ability but not above general population norms **= GOOD**

3= Isolated skill/knowledge that is definitely out of keeping with subject's general level of ability and above the general population normal level but is not used adaptatively in a real life situation to any marked extent **= UNUSUAL**

4= Isolated skill/knowledge that is above the subject's general level and normal population level of ability and is used meaningfully i.e. genuine talent **= UNUSUAL**

Appendix XIII

Codings and Ranks used in Analyses in Chapter Eight

The following information relates to the items listed in the tables in Chapter Eight: Social Functioning. For each item the codings given in the informant report or observational assessment are given on the left-hand side. These codings were then given categorical labels (as shown in capitals on the right-hand side). For the purposes of the Mann-Whitney analysis these categories were ranked from highest to lowest in the order shown here.

(a) TABLE 8.1: NON-VERBAL COMMUNICATION
(All the data in this table were derived from observational information)

Smiling	
0= Appropriate varied use of smiles	**NOT ODD**
1= Smiles in a limited or stilted way	**MARGINALLY ODD**
2= Rare or inappropriate smiles	**DEFINITELY ODD**
3= No smiles	
Facial expression	
0= Uses a range of appropriate facial expressions	**NOT ODD**
1= A few natural expressions, but others odd, stilted or mechanical in manner	**MARGINALLY ODD**
2= Expressions reduced or almost totally lacking	**DEFINITELY ODD**
Social distance	
0= Appropriate posture and changes in distance between S and E.	**NOT ODD**
1= Sustains roughly approximate position but with limited changes or over-relaxed or stiff posture (does not include getting up and moving away).	**MARGINALLY ODD**
2= Position definitely inappropriate; remaining far distant and/or suddenly coming too close.	**DEFINITELY ODD**

Linkage of non-verbal communication with language production
(coded on basis of vocalizations used, irrespective of their frequency; most typical coded, not best).

0= Vocalization is usually accompanied by subtle and socially appropriate changes in gesture, eye gaze and facial expression	**NOT ODD**
1= Vocalization accompanied by abnormal, limited or less than usual frequency and/or range of gesture etc., or use of one modality almost exclusively (e.g. frequent use of eye gaze but very limited use of gesture and facial expression)	**MARGINALLY ODD**
2= Little or no non-verbal communication linked with vocalization	**DEFINITELY ODD**
8= N/A no predominant pattern or no vocalization	

(b) Page 167
(all the data in this section were derived from the informant interview).

Sense of humour

0= Age appropriate sense of humour	**NORMAL**
1= Some limited understanding of humour in different situations, e.g. immature or very literal understanding	**LIMITED**
2= Some appreciation of slapstick humour only and/or socially inappropriate 'off-beam' sense of humour	**ODD OR ABSENT**
3= No apparent understanding of humour as understood by other people	

Turn-taking

0= Participates normally with turn-taking	**NORMAL**
1= Appears somewhat limited in understanding of turn-taking, needs prompting but can take it in with guidance	**LIMITED**
2= Little or no understanding of turn-taking	**VERY LITTLE OR NONE**
3= No interactive play of any sort	

Understanding rules

0= Understands and takes part according to the rules	**NORMAL**
1= Somewhat limited appreciation of details of rules, but understands that games have rules	**LIMITED**
2= Little or no understanding of rules	**VERY LITTLE OR NONE**
3= No interactive play of any sort	

(c) TABLE 8.2: SOCIAL BEHAVIOURS AND RESPONSES

Greeting behaviour (i) Informant report 0= Shows clear-cut pleasure in greeting people of whom he is fond	**ADEQUATE**
1= Some spontaneous greeting response but rather reduced in frequency, predictability or quality	**MARGINAL**
2= Little or no form of spontaneous greeting, but limited response to prompts 3= No greeting response	**POOR**
Amount of social overtures (i) Observational information 0= Frequent attempts to get or maintain E's attention and/or to direct E's attention to objects or actions of interest to S. May include repeated questions or non-verbal behaviours if they are not related to preoccupations nor aimed at getting objects, but seem to function primarily as a method of social contact.	**ADEQUATE**
1= Some attempts at getting, maintaining or directing E's attention (as in '0'), but reduced in frequency/amount or in the number of contexts used	**MARGINAL**
2= The S shows little concern as to whether E is paying attention to S and/or makes few attempts to get, maintain or direct E's attention	**POOR**
Quality of social overtures (i) Informant report 0= Focused intentionality i.e. integrates appropriate expression, gesture and words	**ADEQUATE**
1= Somewhat limited social overtures and/or for personal demands only	**MARGINAL**
2= Inappropriate social overtures i.e. lack of integration and social quality 3= Negligible social overtures of any kind	**POOR**

(ii) Observational information

0= Integrates appropriate facial expression, gesture and words to communicate social intention	**ADEQUATE**
1= Slightly odd quality of social overtures - may often be for personal demands or related to own interest but there is some attempt to involve E in that interest	**MARGINAL**
2= Inappropriate overtures; lack integration and social quality, includes bringing up S's preoccupations with no attempt to involve E in them	**POOR**
8 = Negligible social overtures of any kind	

Quality of social response

(i) Informant report

0= Varied range of responses according to social situation	**ADEQUATE**
1= Somewhat limited responses with limited awareness of social setting	**MARGINAL**
2= Little or no interest in other people or stereotyped and inappropriate responses	**POOR**

(ii) Observational information

0= Varied range of responses according to social situation	**ADEQUATE**
1= Shows responsiveness to social situation but somewhat socially awkward, or inappropriate or inconsistent	**MARGINAL**
2= Limited, stereotyped or inappropriate responses	**POOR**
8= Little or no response to E's attempts to engage S	

Rapport with ADOS examiner

(i) Observational information

0= Comfortable interaction with E that is appropriate to context	**ADEQUATE**
1= Interaction sometimes comfortable but not sustained (e.g. sometimes feels awkward, stilted, or S seems mechanical or inappropriate).	**MARGINAL**
2= One-sided or unusual interaction giving an uncomfortable interview or an interview that would have been difficult if E had not been constantly aware of need to structure situation beyond that provided by the standard activities in ADOS	**POOR**
3= Almost complete disregard for E	

Shared enjoyment in social interaction
(i) Informant report

0= Shows pleasure, has 'playful' quality, able to enter into 'spirit' of occasion	**ADEQUATE**
1= Takes part but somewhat limited show of pleasure, etc.	**MARGINAL**
2= Play clearly lacks 'playful' quality of shared enjoyment; doesn't enter into the 'spirit' of the occasion 3= No interactive play of any sort	**POOR**

(ii) Observational information

0= S shows definite appropriate pleasure in interactive participation or conversation during more than one task or conversational topic	**ADEQUATE**
1= S shows some appropriate pleasure in E's actions, or shows some pleasure during one interaction	**MARGINAL**
2= S shows little or no expressed pleasure in interaction. May show pleasure in own actions or part of conversation, but not in E's behaviour or in interaction	**POOR**

(d) PAGE 171
(All data in this section were derived from the informant interview)

Making acquaintances

0= Normal range of casual social contacts, able to make social relations at clubs, social gatherings, shops etc.	**NORMAL**
1= Interactions with acquaintances and/or casual social contacts either limited in scope/number or awkward in quality	**SLIGHTLY ODD**
7= Large range of acquaintances with whom interactions unusual in quality (makes extensive contacts with shopkeepers, bus drivers etc.). 2= Little or no making of acquaintances	**VERY ODD**

Experience of being teased

0= No more than usual amount of teasing	**NOT FREQUENT**
1= Teased somewhat more than other people	**FAIRLY FREQUENT**
2= Very frequently teased	**VERY FREQUENT**
3= Constant figure of fun/mocking or frequently tormented to marked degree	

Appendix XIV

Changes in School Placement

A complete history of the types of schools attended was available for each subject. Figures App.1 and App.2, overleaf, provide a summary of the types of school attended by the autistic and DLD individuals respectively, between the ages of 5 years and school-leaving age. This overall time-period was divided into three stages covering the periods 5-8 years, 9-13 years and 13 years to school-leaving age. At each stage the type of school attended for the longest period during that time was the one which was recorded.

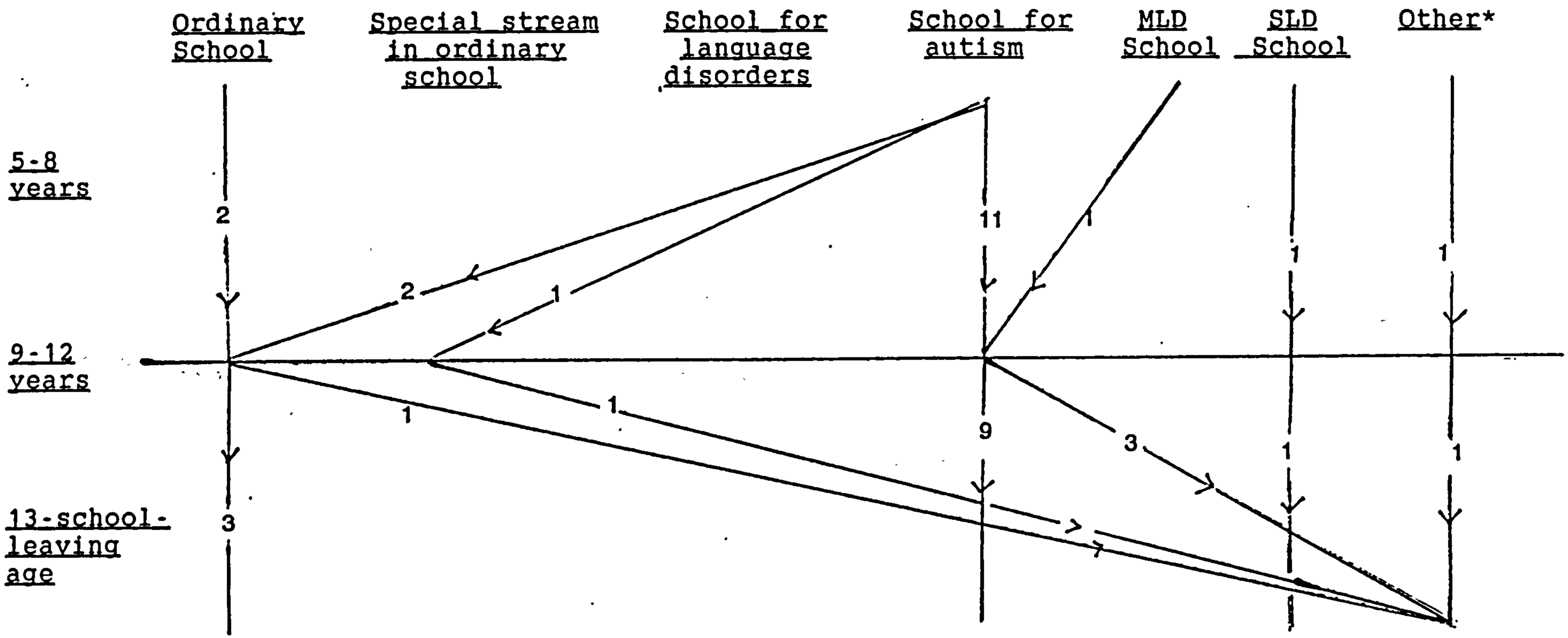
These diagrams are somewhat complicated but the very fact that simple visual inspection quickly reveals Figure App.2 to be the more complex, demonstrates well that the DLD individuals had a greater variety of educational placements and more changes in types of schools than did the autism group. 57.9% (n = 11) of the autistic individuals stayed within the same category of educational placement throughout their school careers, whereas this was the case for only 35% (n = 7) of the DLD group. Amongst the autism group the most frequent category of placement was in specialist schools for autism that 78.9% (n = 15) of the members attended at one stage or another, and 42.1% (n = 8) stayed in for their entire school careers. Only one autistic individual (5.3%) was placed in an ordinary school throughout.

Amongst the DLD group there were 60% (n = 12) who attended a specialist school for language disorders during at least one stage, but only one member of the group (5%) stayed in this category of school for the duration of his educational career. Five individuals (25%) only ever attended ordinary schools.

FIGURE APP.1

Changes in School Placements for the Autistic Group between the ages of 5 years and school-leaving age

(n = 19)

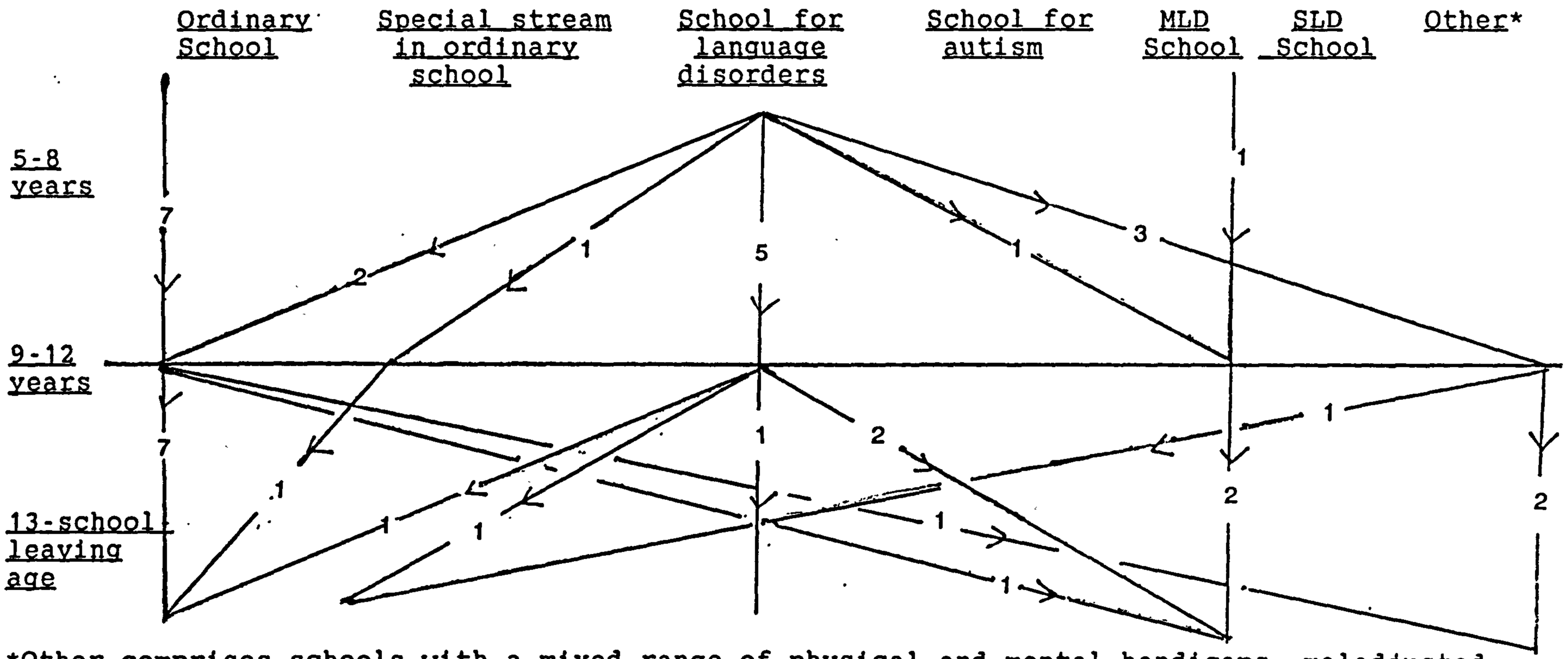


*Other comprises schools with a mixed range of physical and mental handicaps, maladjusted schools and assessment centres.

FIGURE APP.2

Changes in School Placements for the DLD Group between the ages of 5 years and school-leaving age

(n = 20)



*Other comprises schools with a mixed range of physical and mental handicaps, maladjusted schools and assessment centres.

Appendix XV
Codings and Ranks used in Analyses in Chapter Ten

The following information relates to the items listed in the tables in Chapter Ten: Independence. For each item the codings given in the informant report or observational assessment are given on the left-hand side. These codings were then given categorical labels (as shown in capitals on the right-hand side). For the purposes of the Mann-Whitney analysis these categories were ranked from highest to lowest in the order shown here.

(a) TABLE 10.2: ASPECTS OF INDEPENDENT FUNCTIONING
(All data in this table were derived from the informant interview)

Self-Care	
0= Needs no assistance with self-care.	**INDEPENDENT**
1= Needs assistance with a few part areas only . (e.g. blow-drying hair)	**MARGINAL INDEPENDENCE**
2= Needs major help with some areas (e.g. shaving, washing hair).	**LITTLE INDEPENDENCE**
3= Only able to do routine washing/toileting independently.	
4= Needs help even with routine washing/toileting.	
Use of telephone	
0=Uses telephone independently to contact both family/ friends and others, uses telephone directory, able to cope with wrong numbers etc.	**INDEPENDENT**
1= Uses telephone independently, but some limitations in dealing with difficulties (e.g. wrong number, person wanted not available, crossed line etc.).	**MARGINAL INDEPENDENCE**
2= Uses telephone only to family/friends: not able consistently to cope with 'phoning strangers or to manage when difficulties arise.	**LITTLE INDEPENDENCE**
3= May or may not speak on telephone but cannot use telephone independently.	
Driving	
0= Has full driving licence for car or motor cycle and drives regularly without supervision.	**INDEPENDENT**
1= Has provisional licence but has not yet passed driving test OR has full licence but does not drive without supervision.	**MARGINAL INDEPENDENCE**
2= Uses motorised vehicle on private land only.	**LITTLE INDEPENDENCE**
3= No driving	

Managing finances	
0= In charge of own finances: has bank/PO account and /or budgets in sensible way (only occasionally helped out to buy major items	**INDEPENDENT**
1= Basically in charge of own finances; but budgeting rather odd (e.g. takes out money daily from bank) and needs bailing out occasionally.	**MARGINAL INDEPENDENCE**
2= Manages 'pocket money' e.g. buys newspapers, sweets, cigarettes but no responsibility for major purchases.	**LITTLE INDEPENDENCE**
3= No budgeting of finances: unrealistic notions of money and/or someone else has charge over income/provides food, clothing etc.	
Purchasing major items	
0= Able to purchase major items entirely independently.	**INDEPENDENT**
1= Takes main responsibility for purchasing major items but some guidance or assistance.	**MARGINAL INDEPENDENCE**
2= Plays some minor part in that takes some lesser responsibility for part-tasks but major purchasing responsibility taken by someone else.	**LITTLE INDEPENDENCE**
3= Little or no responsibility for major purchases.	
Travel	
0= Plans own journeys and copes with independent long-distance or non-routine travel involving several changes or connections.	**INDEPENDENT**
1= As for '0' coding but needs minor help in planning, in dealing with connections, or in sorting out payment etc. Code '0' if S has difficulty only when changes needed (e.g. missed connection or train cancelled or alteration in route required).	**MARGINAL INDEPENDENCE**
2= Unable to cope with independent long distance or non-routine travel but manages routine local travel involving at least one change on own.	
3= Copes only with routine local travel not involving changes in connections.	**LITTLE INDEPENDENCE**
4= Does not undertake any independent travel involving transport.	
Holidays	
0=Organises own independent holidays (with friends or with travel company etc.).	**INDEPENDENT**
1= Organises own holidays etc. but with special groups (e.g. Holiday Fellowship).	**MARGINAL INDEPENDENCE**
2= Holidays/travel organised by family	**LITTLE INDEPENDENCE**

(b) TABLE 10.6: NAIVETY

Concept of marriage (i) Subject report	
0= Some indication of special qualities of marriage (e.g. commitment, involvement, responsibility)	**MATURE CONCEPT**
1= Some indication of knowledge about concrete aspects of marriage *relevant to both parties* (e.g. live together, or move away from parents, living in a house, sexual relationship if considered from point of view of both parties)	**MARGINAL CONCEPT**
2= Some description of peripheral or egocentric aspects of marriage relevant only to self (i.e. get a day off, sex may be coded here if described in egocentric fashion) 3= No evidence of understanding of concept (e.g. I could be an astronaut)	**DEFINITELY IMMATURE CONCEPT**
Concept of friendship (i) Subject report	
0= Some description in terms of shared activities *plus* shared enjoyment or exchanged confidences or intimacy or exclusiveness of relationship (e.g. 'I like being with X; we play football together' or 'we have fun together; we tell each other jokes' or 'we go to each other's houses; I tell X my secrets')	**MATURE CONCEPT**
1= Some description in terms of shared activities *or* shared enjoyment etc.	**MARGINAL CONCEPT**
2= Description only in general terms (e.g. 'I talk to him when I go to his shop' or 'we go to the same school' or 'he's nice to me'). 3= No indication of understanding of *concept* of friendship, though sufficient language skills to give examples of particular friends (real or otherwise) 7= Irrelevant or peripheral comments (e.g. he's got black hair')	**DEFINITELY IMMATURE CONCEPT**

Concept of career
(i) Informant report

0= Has definite future work plans that are appropriate and realistic, and has appreciation of practical implications of future work choice (to code '0' it is not necessary for the S to have a definite job in mind provided that the next career steps have been considered realistically).	**MATURE CONCEPT**
7= Little or no plans for a career but normal appreciation of what is involved in choosing a job/future work choices	
1= Has future work plans but only a limited recognition of steps needed to reach goals *or* has future work plans that are appropriate in general direction but inappropriate in terms of a failure to appreciate personal limitations (e.g. a person with accountancy qualifications who has been unable to get promotion because of an inability to take responsibility but who wishes to be a bank manager)	**MARGINAL CONCEPT**
2= Has plans for future work that are clearly inappropriate (e.g. a person good in maths but without accountancy qualifications who wants to be a bank manager) or that are lacking in recognition of the practicalities involved (e.g. wants to be an astronaut or a film star).	**DEFINITELY IMMATURE CONCEPT**
3= Little or no plans for future work and little or no appreciation of what is involved in future work choices	

Concept of why others get annoyed with him
(i) Informant report

0= Normal level of awareness of causes of annoyance, including S's own role	**MATURE CONCEPT**
1= Some appreciation of why other people annoyed with S but often fails to understand	**MARGINAL CONCEPT**
2= Little or no understanding of S's own role in causing annoyance and may blame others	**DEFINITELY IMMATURE CONCEPT**
3= Usually unaware what has caused annoyance	

Planning for the future
(a) Informant report

0= Realistic idea of what the future holds; beginning to make appropriate plans for this in terms of likely possibilities	**MATURE CONCEPT**
1= General realisation that things will change and the need for some sort of planning but plans rather vague or somewhat impractical	**MARGINAL CONCEPT**
2= Some concept of future but no plans of own; generally reliant on others to organize for him	**DEFINITELY IMMATURE CONCEPT**
3= Little or no concept of future in terms of likely changes and the need for some sort of planning, or unrealistic notions of future without much notion of what plans entail (e.g. general unrealistic plan to get married, become rich or be a TV star)	

Appendix XVI

Occupation at the Time of Follow-Up

	Job title	Category of job
AUTISM		
1	Parks assistant	Voluntary
2	Attends day centre	
3	Reads newspapers for the blind	Job under special arrangements
4	Attends day centre	
5	In residential placement	
6	In residential placement	
7	In residential placement	
8	In residential placement	
9	In residential placement	
10	In residential placement	
11	In residential placement	
12	In residential placement	
13	Factory worker	Job under special arrangements.
14.	Attends day centre	
15.	In full-time education (A'Levels)	
16.	No occupation/placement	
17	Attends day centre	
18	In full-time education (undergraduate)	
19	Laboratory technician/MSc. student	Independent regular job
DLD		
1.	Atends day centre	
2	No occupation/placement	
4	Machine operator	Independent regular job
6	Drain and sewage maintainer	Independent regular job
7	Factory worker	Job under special arrangements - factory belongs to family friends.
8	No occupation/placement	
9	Cathedral cleaner	Voluntary
10	No occupation/placement	
11	Stock control clerk	Independent regular job
12	Security guard	Independent regular job
13	Machine operator	Independent regular job
14	No occupation/placement	
16	Attends day centre	
17	Kitchen porter	Independent regular job
18	Factory worker	Independent regular job
19	Joiner	Independent regular job
20	Shop assistant	Independent regular job
21	Taxi driver	Independent regular job
22	Street cleaner	Independent regular job
23	Painter and decorator	Independent regular job

Appendix XVII

Codings and Ranks used in Analyses in Chapter Twelve

The following information relates to the items listed in the tables in Chapter Twelve: Behavioural Functioning. For each item the codings given in the informant report or observational assessment are given on the left-hand side. These codings were then given categorical labels (as shown in capitals on the right-hand side). For the purposes of the Mann-Whitney analysis these categories were ranked from highest to lowest in the order shown here.

(a) TABLE 12.1: BEHAVIOURS TYPICALLY ASSOCIATED WITH AUTISM

Unusual preoccupations

(i) Informant report

0= None	**NO ABNORMALITY**
1= Special interests(s) of unusual degree but not intrusive	**MARGINAL**
2= Definite repetitive preoccupation(s) that does not cause substantial interference to, but does intrude on, family life	**DEFINITE ABNORMALITY**
3= Definite preoccupation(s) that causes substantial interference in family life or may totally prevent some activity	

(ii) Observational information

0= No abnormally preoccupying object, activity (e.g. repetitive drawing) or topic of conversation (e.g. a specific pop star)	**NO ABNORMALITY**
1= Stereotyped or restricted patterns of interest of unusual degree but not intrusive in the interview	**MARGINAL**
2= Definite preoccupation(s) with stereotyped or restricted patterns of interest that intrude and occasionally interfere with social communication	**DEFINITE ABNORMALITY**
3= Definite preoccupation(s) that causes substantial interrference in the interview	

Compulsions/rituals
(i) Informant report

0= None	**NO ABNORMALITY**
1= Unusually routinized in activities but no activity that appears compulsive in quality	**MARGINAL**
2= One or more activities that subject has to perform in a special way. Subject appears under pressure or to become anxious iif activity disrupted. Compulsive quality present but little interference with family life or social impairment	**DEFINITE ABNORMALITY**
3= One or more activities which subject HAS to perform in a special way. S. appears under marked pressure or to become extremely anxious or distressed if activity disrupted. Degree of compulsive quality intrudes on family life or causes definite social impairment to subject and/or others	

(ii) Observational information

0= No obvious activities or verbal routines that must be completed in full	**NO ABNORMALITY**
1= Unusually routinized in speech or activities but no behaviour that appears compulsive in quality	**MARGINAL**
2= One or more activities/verbal routines that subject has to perform or say in a special way. Subject appears under pressure or becomes anxious if activity disrupted (i.e. compulsive quality present). Includes making lists (e.g. friends, favourite foods) or insisting that E respond verbally in highly specific way.	**DEFINITE ABNORMALITY**

Resistance to change
(i) Informant report

0= None	**NO ABNORMALITY**
1= Unusually negative reaction to changes in routine or in environment but with no apparent distress and little or no interference in family life	**MARGINAL**
2= Definite unusual and marked reaction to changes in routine etc., causing marked distress but without substantial interference in family life	**DEFINITE ABNORMALITY**
3= Definite unusual and marked resistance to change with substantial interference and/or impairment of family activities	

Unusual sensory interest
(i) Informant report
0= None — **NO ABNORMALITY**

1= Shows one or two unusual interests regularly (a few times a day) — **MARGINAL**

2= Preoccupation with unusual sensory interest that takes up a major amount of time or prevents/limits alternative use of that play material or food to the exclusion of other aspects of play or eating — **DEFINITE ABNORMALITY**

(ii) Observational information
0= No sniffing, repetitive touching, feeling texture, mouthing or unusual/prolonged visual examination — **NO ABNORMALITY**

1= Occasional (one or two) unusual interests in conjunction with a variety of other types of behaviour — **MARGINAL**

2= Clear interest in non-functional elements of play materials or sensory examination of self or others — **DEFINITE ABNORMALITY**

Verbal rituals
(i) Informant report
0=.None — **NO ABNORMALITY**

1= Tendency to say things in ritualised way or to require others to do so but no indication that compulsive and readily stops if asked to do so — **MARGINAL**

2= Subject HAS to say one or more things in a special way. The ritual may intrude on family life. May involve other family members. Some distress at interruption but little or no social impairment — **DEFINITE ABNORMALITY**
3= As for '2' but with marked difficulty to control and marked intrusiveness in family life. Other family members involved to a degree that causes definite social impairment and disruption. Serious distress at any attempted interruption

Unusual attachment to objects
(i) Informant report
0= No attachment — **NO ABNORMALITY**

1= Some attachment to slightly unusual object such as piece of paper, soft brush etc, but puts down if asked to do so and no interference with activities — **MARGINAL**
2= Attachment to unusual object associated with distress on separation and/or caretakers try to ensure object always readily available for subject. — **DEFINITE ABNORMALITY**
3= Attachments so intrusive that prevent many everyday activities

Hand and finger mannerisms
(i) Informant report

0= None	**NO ABNORMALITY**
1= Occasional only (less than once a day) or type not as clearly specified as for '2'	**MARGINAL**
2= Definite freqent (more than once a day) hand/arm flapping and/or finger flicking/twisting but no interference with other activities or distress	**DEFINITE ABNORMALITY**
3= Marked mannerisms of type specified: associated interference/distress	

Other mannerisms or stereotyped movements
(i) Informant report

0= None	**NO ABNORMALITY**
1= Occasional only (less than once a day)	**MARGINAL**
2= Definite, frequent (more than once a day) either mannerisms or stereotypies but no interference with other activities or distress	**DEFINITE ABNORMALITY**
3= Marked and associated interference/distress	

Oddity of gait
(i) Informant report

0= Normal	**NO ABNORMALITY**
1= Somewhat unusual but not definitely abnormal	**MARGINAL**
2= Definitely odd gait (e.g. toe-walking or abnormal bouncing)	**DEFINITE ABNORMALITY**
3= Gait sufficiently odd to be the subject of comment by others	

Appendix XVIII

Items Covered in Maladaptive Behavior Domain of Vineland Adaptive Behavior Scales

Sucks thumb or fingers

Is overly dependent

Withdraws

Wets bed

Exhibits an eating disturbance

Exhibits a sleep disturbance

Bites fingernails

Avoids school or work

Exhibits extreme anxiety

Exhibits tics

Cries or laughs too easily

Has poor eye contact

Exhibits excessive unhappiness

Grinds teeth during day or night

Is too impulsive

Has poor concentration and attention

Is overly active

Has temper tantrums

Is negativistic or defiant

Teases or bullies

Shows lack of consideration

Lies, cheats, or steals

Is too physically aggressive

Swears in inappropriate situations

Runs away

Is stubborn or sullen

Is truant from school or work

Engages in inappropriate sexual behavior

Has excessive or peculiar preoccupations with objects or activities

Expresses thoughts that are not sensible

Exhibits extremely peculiar mannerisms or habits

Displays behaviors that are self-injurious

Intentionally destroys own or another's property

Uses bizarre speech

Is unaware of what is happening in immediate surroundings

Rocks back and forth when sitting or standing

Appendix XIX
Categories of Inappropriacy

What follows is a list of the 'categories of inappropriacy' devised by Bishop and Adams, and used by Eales in his analysis. For a comprehensive description of the categories and examples see Bishop and Adams (1989).

Expressive semantics/syntax

Failure to comprehend literal meaning

Pragmatics I: Violation of exchange structure

Nil response

Ignores initiation

Pragmatics II: Failure to use context in comprehension

Pragmatics III: Too little information

Inappropriate presupposition ('pseudo-ellipsis)

Unestablished referent

Logical step omitted

Pragmatics IV: Too much information

Unnecessary assertion/denial

Excessive elaboration

Unnecessary reiteration

Ellipsis/reference not used

Unusually or socially inappropriate content or style

Topic drift

Unmarked topic shift

Stereotyped formulaic

Inappropriate questioning

Socially inappropriate

Other

Lack of knowledge/ experience

Unclassified

Appendix XX
The ADOS Algorithm

Note: All Total Scores have been entered already following section scores but are repeated here for convenience.

Area I Reciprocal Social Interaction (Total Score)	p.25/p.32	SOCTOT
Cut-off Criteria Met (0=no, total score of 0-5; 1=yes, total score of 6 or more)		CCSOC
Area II Communication (Total Score)	p.25/p.29	LANGTOT
Cut-off Criteria Met (0=no, total score of 0-3; 1=yes, total score of 4 or more)		CCLANG
Area III Repetitive, Restricted and Stereotyped Behavior (Total Score)	p.28/p.36	RRTOT
Cut-off Criteria Met (0=no, total score of 0-1; 1=yes, total score of 2 or more)		CCRR
Overall Score (Sum of Total Scores from Areas I to III)		OVSUM
Number of Areas (I, II, III) Meeting cut-off criteria		CCNUM
ADOS ALGORITHM DIAGNOSIS OF AUTISM IN SOCIAL AND COMMUNICATIVE AREAS (If SOCLANG is 10 or more, OR, if CCSOC and CCLANG are BOTH 1, enter 1 for yes; if not, enter 0)		DXSC
FULL ALGORITHM DIAGNOSIS OF AUTISM Cut-off Criteria Met (0=absent, 0-2 areas meeting criteria, CCNUM=0-2; 1=present, all 3 areas meeting criteria, CCNUM=3)		AUTOE3
COMBINED DIAGNOSIS OF AUTISM (Social and comminication criteria from ADOS met, in addition to ADI criterion for restricted, repetitive interests/behaviors. If ADOS DXSC=1 and AREA4 on ADI=4 or more, code 1 for yes. If not, code 0)		TOTAUT

ADOS Algorithm

Area No. I: Qualitative Impairments in Reciprocal Social Interaction (7 items)

Section (i) "Failure to use eye-to-eye gaze, facial expression, body posture and gesture to regulate social interaction."

Item	ADOS Page old/new	Score	Code
Unusual eye contact	p.27/p.35		EC
Facial expression	p.27/p.35		FE
Social distance	p.26/p.34		SDIST
Nonverbal behaviours linked with language	p.23/p.29		NVLINK
	Section Score		SOC1

Section (iv) "Lack of shared enjoyment, i.e., vicarious pleasure in other people's happiness and/or spontaneous seeking to share their own enjoyment through joint involvement with others."

Shared enjoyment	--/p.33		SE

Section (v) "Lack of socioemotional reciprocity, as shown by an impairment or deviant response to other people's emotions; and/or a lack of modulation of behaviour according to social context and/or a weak integration of socioemotional and communicative behaviours."

Overall quality of rapport	p.26/p.34		RAPP
Quality of social response	p.25/p.33		QRESP
Quality of social overtures	p.25/p.32		QOV
Social disinhibition	p.26/p.34		DISINH
	Section Score		SOC4
	Total Score Area No. I (cutoff score: 6)		SOCTOT

Area No. II: Qualitative Impairment in Communication
(6 items)

Section (ii) "A relative failure to initiate or sustain conversational interchange (at whatever level of language skills is present) in which there is reciprocal to and fro responsivity to the communication of the other person"

Conversation	p.22/p.29	CONV
Report of things	p.23/p.29	REP
	Section Score	LANG2

Section (iii) "Stereotyped and repetitive use of language and/or idiosyncratic use of words or phrases."

Neologisms/Idiosyncratic speech	p.24/p.31	NIDIO
Inappropriate questions or statements	p.24/p.32	INQS
Pronominal reversal	p.24/p.30	PRON
	Section Score	LANG3

Section (iv) "Abnormalities in pitch, stress, rate, rhythm and intonation of speech."

Speech abnormalities associated with autism (i.e. in intonation, volume, rhythm, or rate)	p.23/p.30	ABSPEE
	Section Score	LANG4

Section (v) "Lack of varied spontaneous make - believe play or (when young) imitative play."

Imagination/Creativity	p.27/p.35	IMAG
	Section Score	LANG5
	Total Score	LANGTOT
	Area No. II (cutoff score : 4)	

Total Score (Areas I and II)	SOCLANG

Area No. III: (4 items) "Restricted, repetitive and stereotyped patterns of behavior, interests, and activities."

Section (i) "Encompassing preoccupation with stereotyped, restricted patterns of interest."

Unusual preoccupation	p.28/p.36	UP

Section (iii) "Apparently compulsive adherence to specific nonfunctional routines and rituals."

Compulsions/Rituals	p.28/p.36	CRIT

Section (iv) "Stereotyped and repetitive motor mannerisms that involve either hand/finger flapping or twisting or complex whole body movements."

Autistic-type mannerisms and stereotyped movements	p.28/p.36	AMAN

Section (v) "Preoccupations with part-objects or nonfunctional elements of play materials (smell, sound, feel, sight)."

Unusual sensory interest	p.28/p.36	USEN
	Total Score Area No. III (cut off score is 2)	RRTOT

Appendix XXI

Glossary of Terms used in Report of Discriminant Function Analysis (Chapter 17)

Eigenvalue A useful statistic for evaluating the worth of a discriminant analysis. An Eigenvalue of '0' means that the discriminant analysis had no discriminating value, whereas an eigenvalue above 0.4 is considered excellent. It is the between-groups variance divided by the within-groups variance.

Wilk's lambda This is the within-groups sum of squares divided by the total sum of square, and gives a measure of the percentage of variance in the predicting variables that can be accounted for by between group differences. A Wilk's lambda of .88, for example, means that 12 percent of the variance is accounted for by between-groups differences. Therefore the lower it is the better the discriminating power of the function.

Group centroid This is the point corresponding to the mean score of the group in each function, and was used here to predict group membership by observing which group centroid the individual subject's discriminant score was closest to.

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